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The Definition of Intelligence in Relation to Modern Methods of Mental Measurement

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THE DEFINITION OF INTELLIGENCE IN RELATION TO MODERN METHODS OF MENTAL MEASUREMENT.

INTRODUCTION

I. Necessity for Establishing a Clear Psychological Setting for the Problem of Intelligence.

Probably all will agree that the problem of intelligence belongs in psychology. Naturally, therefore, one would at first thought feel justified in discussing intelligence in terms of mind, consciousness, and other popularly used psychological terms. There have been times in the history of psychology when this could have been done without raising any question; but even minor excursions into modern psychology show that the leaders in that field are fundamentally divided by different concepts and terminologies. They do not agree as to what mind is. They do not even agree as to whether psychology should assume the existence of mind, or, if it exists, whether psychology should make any attempt to determine its nature.

Hence the student of intelligence is forced to review current psychological theories and to decide as to the attitude which he, himself, shall take. Otherwise any conclusions to which he may come, and any arguments which he may base upon the conclusions, are likely to prove abortive, due to a mere misunderstanding of terms.

The situation is similar to that raised by the ancient dispute as to whether there would be any sound at Niagara if there were no ear there to hear it. The argument must result in endless debate unless one stops to ask whether sound is to be defined in

terms of physics or in terms of psychology. This illustration merely points the observation that since the intelligence problem is at bottom a psychological problem, any attempt to deal with it constructively must use psychological terms with carefully considered and defined meanings. Thus the later argument can be saved from becoming hopelessly at cross purposes.

Two sources of confusion in modern psychological terminology are (1) the term mind or consciousness, and (2) faculties, or functions, of mind. It is desirable that the points of view concerning these be carefully discriminated, and definite ones selected. This is not to be done with the idea of settling the matter once for all; but rather with the idea that although the reader may disagree with the view chosen, he can at least follow the argument of this presentation without confusion.

An attempt will therefore be made in Chapter I to analyze the current views of mind and of its functions, and later to locate the intelligence problem in relation to these views.

II. Recognition of Types of Research.

There was a time when what was known as psychological research was mainly speculation. One could sit down in seclusion, evolve theories, and record them as his contribution. The theories did not need to have much relation to evidence; and they were in fact not often anchored to anything in particular. They systematized themselves with reference to themselves, and remained essentially a closed circle. Then came the era of scientific experiment, and with it the demand that research cease to be speculative and become quantitative. It must observe, record, and systematize facts which had not up to that time been so handled by anyone else. It must make a genuine quantitative contribution to human knowledge. The demand for this quantitative type of research did not carry with it an absolute ban upon philosophical theorizing; but it did insist that theories must accord with facts, in so far as the pertinent facts were known; and that new quantitative researches should always be engaged in turning up additional facts, with which facts the theories must be kept in line. The real research lay in the development of the new facts.

Such is now the prevailing view. But it may be pointed out that after such research has proceeded to a certain point, its own success develops the necessity for another type. To make this clear one has only to call attention to the fact that as experiment after experiment piles up endless facts in a given field certain complications inevitably arise. This is particularly the case in the rather intangible field of the social sciences. The results of some experiments confirm each other in whole or in part; some are mutually contradictory; while some are difficult to bring into any kind of relation with others.

When the mass of the material on a given problem has grown to large proportions, and still the solution seems as far away as ever, it is time to take account of stock. It is time to attempt to find in the tangle a general trend which may point the way to a more profitable line of attack. That is, research is needed which is a search for organization within the products of other researches. This type of supplementary research requires that a rather exhaustive study of the field be made; that efforts of different investigators be brought into relation to each other and to principles involved; that irrelevant details be excluded and relevant ones emphasized; and that the whole be brought to a focus.

III. The Relation of Hypothesis to Research.

The research for organization among the products of unrelated researches furnishes the basis upon which extensions may be attempted. Such a study of conditions makes it possible to formulate a guess as to certain other things which are probably true, but which have not yet been adequately proved. This guess, controlled by a consideration of the investigations which have preceded, is an hypothesis. Its significance is, or should be, determined by the significance of the previous work, and by the skill with which such work has been probed and interpreted. To continue quantitative work indefinitely without subjecting it occasionally to such clearing-house methods as result in a clarified and consistent hypothesis is, to say the least, wasteful. But

when the revised hypothesis has been arrived at, there then exists a logical demand for new quantitative work which shall put it to the severest test.

IV. The Objectives of this Thesis as Guided by the Considerations Mentioned Above.

A. To locate more definitely the problem of intelligence in relation to fundamental points of view in psychology.

B. To use clearing-house methods of research upon the present situation with regard to intelligence in an attempt (a) to establish a definition of intelligence, (b) to discriminate types of intelligence, and (c) to discriminate a pivotal type.

C. To further clarify the situation by relating existing quantitative studies to the types of intelligence.

D. To develop an hypothesis concerning the fundamental nature of the pivotal type of intelligence; and to test this hypothesis by quantitative research.

E. To apply the conclusions to a critical survey of modern methods of mental measurement.

CHAPTER I

Factors in a Psychological Setting for the Problem of Intelligence.

I. Psychological views of the existence and function of soul, consciousness, mind, mental states.

The "mind and body" controversy has been a lengthy one, and it is not yet ended. Early psychology was philosophical, metaphysical. It was a speculative study of a consciousness called the soul, whose existence no one questioned. Along with this metaphysical psychology, there naturally appeared an empirical psychology, based upon attempts to describe psychic phenomena through the aid of introspection. Metaphysical and empirical psychology were supplements of each other in that empirical psychology was largely guided by metaphysical views; and metaphysical pschology, on its part, continually used empirical materials. There arose a natural dualism, a contrast between soul (mind) and body (matter). Attempts to escape this dualism led, on the one hand, to the contention that matter was only another manifestation of spirit; or on the other hand to the contention that what was apparently spirit was only another manifestation of matter. Thus there came about a division of psychological thinkers into spiritualistic monists, and materialistic monists.

A hot-bed of discussion of these different points of view is found in the work of Huxley, Tyndall, Clifford, Romanes, etc. The main reason for the break between the old and new views lay in the growing scientific spirit, and in the conception of scientific law characteristic of that spirit. The belief that the world processes rest upon the law of cause and effect, coupled with the belief in the conservation of energy, made it seem impossible that any world of "mind" could "break in" upon a world of matter "locked up in mechanical causation", and change the

cause and effect series. Such a breaking in would require the addition of some energy to that already existing in the world of matter, and so would controvert the law of conservation of energy. As philosophers the scientists might hold speculative views of such a possibility, but as scientists they could see no other answer to the dilemma than monism, either spiritualistic or materialistic. Moreover, with science avowedly dedicated to the study of facts which could be verified in the world of things, it is clear how the drift was toward materialistic monism and the elimination of the "soul" from scientific psychology.

There continued, however, to be psychologists who were dualists, who discussed mind or consciousness, and who meant by it something the same as was meant by the metaphysical psychologist's concept of the soul. They continued at least to conceive of a world of mind and a world of matter; and in spite of the scientific difficulties involved, they believed that the former did have something to do with certain changes which took place in the latter. They were forced to this view by their observation of the organism as an "adaptation system". They saw this organism changing its behavior with reference to its environment. That is, they saw that the mechanical systems of prearranged instinctive response did not always run to their apparently inevitable conclusion. Behavior did vary to suit circumstances. Some of this variation, or adaptation, could be explained mechanically by the conflict of mechanical systems or otherwise; but some of it could not. The psychologist, judging certain other things by his experience with himself, believed that adaptation sometimes came about through an effective mental agent acting as a real power of choice between possible systems of action. Thus in his judgment the systems did not always run freely to their mechanical conclusions. He conceived of a mind or consciousness whose specific function was to interfere in those situations which demand behavior for which mechanical systems are inadequate.

But it was necessary to put forth a theory as to how this relationship between the world of mind and the world of matter was possible. There could be but two theories. Either there was direct interaction between the two worlds, or there was par-

allel action between them. Upon the theory of interaction the immaterial mental agent must leap the gap between it and the material world, and exert itself directly. This theory has not been very popular among the scientists, because it runs directly against the scientific difficulties already mentioned.

Upon the theory of parallel action, however, the question was in a way pigeon-holed. It was admitted that the asserted gap between the material and the immaterial world does exist; that the human mind can not conceive of the immaterial as acting upon the material; and that, therefore, the gap can not be conceived as bridged. But it was asserted that one could conceive of happenings in the immaterial world corresponding to, or parallel with, happenings in the material world; and that it was not at all necessary for the psychologist to explain *how* this was possible. It was only necessary to postulate that when something happened in one world, it was paralleled by something in the other world. It was not necessary to conceive that one happened because of the other. The claim was merely that when there was a happening in one world, there was a parallel happening in the other.

But even this statement of the case needed to be, and was qualified. Not every happening in the material world as represented by the nervous system, crowned by the brain, is accompanied (paralleled) by consciousness—by a happening in the mind. The stimulation must reach a certain portion of the nervous system—the cortex of the brain, and there must be a certain intensity of neural action in this cortex before the limen is passed and the mental life involved. But given this sufficient intensity of neural activity in the cortex, (in the material world), then the theory holds that there is parallel activity in the mind (the immaterial world).

But what about the power of the mind to break in upon, and to modify, the happenings in the material world of neural activity? What about the ability of the mind to execute its *purposes?* Parallelism is still a sufficient answer. One does not need to think of the change as caused by the mind. He only needs to think of the change as accompanying the given mental state.

The happenings in one world are conceived as so "set" or "tuned" with relation to the other world, that variation in one is accompanied by variation in the other. It may even be that one is a mathematical function of the other; but even in that case the concept is one of mere concomitant, not causal, variation. If one uses the language of interaction, and speaks of the mind breaking in, it is only because such language is more direct and saves the circumlocution which would otherwise be necessary.

In modern psychology, the so-called structuralists accept the parallelistic hypothesis, and so conceive the study of psychology in terms of the action of a nervous system paralleled under certain conditions by mind. They regard the organism as an adaptation system, and believe that mental changes accompany neural changes in the establishment of new adaptations for which the old mechanical systems are inadequate. They do not, however, make any attempt to tell how this occurs. They leave this question to philosophy, while they themselves study the nervous system in unexplained parallel relation to mind, and also try to arrive at the structure of mind through the aid of introspection checked up by the products of performance measured by laboratory instruments of precision.

This structural psychology was on its experimental side the child of the nineteenth century development of scientific physiology. But this trend toward scientific physiology and biology has also been responsible for the development of two other psychological points of view. The first of these is the functionalist view, and the second is the behaviorist view. Both regard the organism as an adaptation system; both tend to speak in biological or neurological terms. Their work puts a strong emphasis upon the nervous system, upon stimulus, and response, neurons and neuron patterns made by prenatal bonds between neurons, or by new bonds resulting from experience. Over these neuron patterns plays the neural force in response to stimuli, and behavior is the result.

The functionalist agrees with the structuralist in admitting the existence of mind, and in making free use of the terms mind, mental state, mental processes, etc.; but his view is perhaps less

dualistic and more materialistic in that he looks upon mind as "the functioning of the brain". There is for him a mental correlate of the physical brain process, but that correlate is the mere process by means of which the brain performs its function. This process, being something different from the brain itself, gives mind a place, and relates the functionalist to the structuralist. But instead of being especially interested in the structure of mind, the functionalist is especially interested in the achievements of mind. He is interested in development, in organic evolution, in how the process has come to be what it is, and in what is its teleological (purposive) significance. So the structuralist and the functionalist are not necessarily different persons. Structuralism and functionalism are different points of view, focused upon different aspects of the total psychological field. They may belong at different times to the same person.

The behaviorist frankly puts mind out of consideration. He says that no one has proved or can prove that there is or is not a mind. Moreover, he says that for the study of psychology it doesn't make any difference. What is important in his opinion is behavior, and the possibility of the prediction of behavior, through the study of the nervous system, its original neuron patterns, and the formation of new patterns through experience. Hence he voluntarily relinquishes the study of mind in favor of the study of behavior explained by a nervous system operating by mechanical, biological law. Behavior counts; it is tangible. It can be objectively measured, is entirely free from metaphysical speculation, and is therefore the real subject matter for science.

There is no doubt that there is a place for this view of the behaviorist. There are certain psychological problems which can be attacked only on the basis of objective data, and this fact gives the behaviorist his field. But again it would seem that it is a part, only, of the total field, cut off by the limitations of a certain view which may be taken by any psychologist at any time. To regard it is an exclusive and all-embracing view, and so to give up the conception of mind as a directive agent, would seem to make the organism a mere automaton at the mercy of external influences. Certain psychologists are not willing to do this.

They feel that the automaton theory is outworn, and that man, at least to a certain extent, can exercise a power of initiative and thus influence his destiny through purposeful choice between responses. They feel that the prediction of behavior must be very incomplete without a study of this mind which has the power to vary behavior through deliberate choice. Thus they feel that to make psychology purely a study of organic behavior without raising the question of a directing mind is almost or quite to make it a study of biology or neurology. It is to them, in a sense, psychology with the psychology left out.

Thus it is clear that if one is to talk about intelligence as a psychological phenomenon, he must choose a definite point of view, especially with regard to the mooted mind or consciousness. This point of view, it goes without saying, need not be exclusively structural, functional, or behavioristic.

The view here taken will agree with the tendency of modern psychologists of all schools to drop the use of the word consciousness in favor of the word mind, or of the expression mental state, since consciousness sometimes carries with it a connotation more philosophical than scientific. There will, however, be disagreement with some psychologists in that (1) it will be assumed that mind does exist coextensive with a certain intensity of neural activity in the cortex, and (2) in that the parallelistic hypothesis will be accepted, but for convenience the language of interaction will be used. The specific function of mind will therefore be conceived as that of breaking in upon the mechanical causation of mechanical systems of response, thus making itself felt in changed behavior.

II. The modern theory of a unitary mind.

The assumption that mind exists, and at times exercises a directive power over behavior, has been accepted. Another step may be taken through the medium of a discussion of mental "faculties". The older metaphysical psychology, in its attempt to analyze the soul, naturally discriminated such faculties (functions) as sensation, perception, memory, imagination, etc. Even the most modern parallelistic hypothesis must be carefully safe-

guarded or it falls into the same trap. The very attempt to differentiate between brain and mind is conducive to the difficulty. One thinks of neural activity in the cortex, and of a gradually increasing intensity in this activity. Perhaps it is a neural activity stimulated by light. When the intensity passes a certain limit the brain activity is paralleled by the simplest possible mental activity. This simplest possible mental state is given the name sensation. It becomes immediately natural to say that the mind has a faculty of registering sensations, and to discuss sensation as a mental faculty.

As more and more stimuli bent upon the end organs, raise the intensity of neural activity in the brain, and are paralleled by more and more sensations, immediate sensations merge with the associated past sensations into percepts. This gives the mind a faculty of perception. Then the power to bring back to mind the image of the thing itself is focused upon. Recognized images are responsible for a faculty of memory; vivified and reconstructed images, for a faculty of imagination; images used as symbols of meaning, for a faculty of ideation; and the relating of these images, for a faculty of thinking.

The difficulty with this scheme does not lie so much in the conception of the "faculties" as it does in the emphasis upon the independence of the faculties in action, and the correlated emphasis upon their ability to take training. The view was naturally evolved that through the training of any particular faculty a particular kind of power could be stored up and remain ready to be drawn upon for future use. Specific memory power, specific thinking power, etc., could thus be put in "cold storage" as it were, for a season when they might be needed.

Modern psychology, however, for sufficient reasons which do not need to be detailed here, has largely discarded the faculty idea, together with much of its attendant storage or "reservoir" theory. Some of the faculty names are preserved, because they express something which only the names can compass; but, nevertheless, mind, to the modern psychologist, is not cut up into separate parts, and does not act in separate parts. Mind acts as a whole, as a unit. When there is mental activity, it is activity of

the whole mind—of a unitary mind. But this unitary mind can be focused in various directions. That is, one may speak of memory as a typical process of psychical activity. Mind as a whole, acts in this form. Recall is the main consideration, and is in the foreground; but all of the rest of the mind is in the background contributing its part. An analogy may be found in the one-celled organism, the amoeba, which can wrap a fold of its body about a minute particle of food, use the enclosing sack as a stomach, and digest the food. The focus is toward the sac; the form of activity is digestion; but all the amoeba body behind the sac is contributing its share to the process. The digestive function is a function; but not a function separate and independent in action. To carry the illustration a little further, the amoeba can also, in its attempts at locomotion, put forth a "foot" in any direction. Thus the body is focused anew in a new form of activity; but the foot is not separate and independent. It is, as it were, only a sign of the complete and unified action of the whole.

It is only in some such sense that terms such as sensation, memory, imagination, etc., are used in modern psychology. When neural activity of sufficient intensity occurs in the brain it is accompanied by sensation in the mind. But it is to be particularly remembered that this means just what it says. The sensation is *in* the mind so definitely as to be really but a name for a focus of the total mind. It is a sign of the complete and unified activity of this focused total mind. It is in such a sense, only, that use is made in this thesis of the term mental function, or of the specific names of specific functions.

CHAPTER II

Current Views of Adaptation and Mind in Relation to Intelligence.

I. The confusion which these terms present.

Psychologists are agreed upon regarding the organism as an adaptation system. There is a difference of opinion about the rôle played by mind; but the assumption is here made that mind exists, and that it is, at times, a directive agent in adaptation. What about the relation of the terms adaptation and mind to the term intelligence? Current usage is very loose, and the result is confusion which can be cleared up only by first finding some common ground upon which all views meet, and then analyzing the difficulties beyond that point. The common ground is found in the fact that all usage agrees in placing the problems of intelligence within the problem of adaptation.

Further analysis, however, shows that there are writers who are willing to call all adaptation intelligent. They think of intelligence as belonging to the organic as opposed to the inorganic; and they think of the organic as able to adapt itself to environment, while the inorganic can not. Possibly some who passively accept this point of view have not even stopped to consider that the organic includes vegetable as well as animal organisms, and that vegetable organisms do make adaptations to environment. If this were called to their attention they would probably readily agree that in saying that the organic has intelligence, and the inorganic has not, they had meant to contrast only animal organisms with the inorganic.

There is a class of persons, however, who intentionally include both animal and vegetable organisms when they contrast the organic and the inorganic, and who are willing to call both animal and vegetable organisms intelligent, because of the power of adaptation which they possess. That is, some persons do inten-

tionally claim that ability to make adaptations is identical with intelligence.

The source of the confusion lies in the failure to realize that adaptation is such a broad term that it must be split up into a number of different types of adaptation. Unless these types are discriminated in thought and terminology, those who discuss the subject are not speaking the same language because they are not giving the same connotation to the terms which they use. Hence the discrimination of adaptation types is the next problem.

II. Types of adaptation in relation to mind and intelligence.

A. ADAPTATION IN THE INORGANIC WORLD.

There is a use of the word which permits it to apply to the inorganic. Cliffs and other earth contours "are adapted to environment" when they yield to weathering by wind and water. Iron rails are adapted to environment when they expand or contract because of change of temperature. But these bodies are *adapted to* the environment; they do not adapt themselves. They remain passive, and are mechanically adjusted through the play of external agencies. Given approximately the same conditions, the variations which occur tend to be predetermined, and are therefore highly predictable. The body exhibits no spontaneity. There is no active, inner, selective factor which interferes to make the prediction of variation uncertain.

Now the idea of intelligence, no matter how else limited, has never failed to carry with it the assumption that, to some degree at least, the possessor is able to exercise a relatively non-predictable selective inner influence upon its own destiny. Hence there is no current reputable usage of the term intelligence which will permit its application to the inorganic. This is so self-evident that it would be a waste of words to say it, if it were not for the slip which sometimes identifies intelligence with adaptation. The inorganic does, in a sense, have adaptation. It does not have intelligence. Hence intelligence cannot be used as synonymous with adaptation without opening the door to confusion. Accordingly, in organizing the uses of the term adaptation, this thesis

will distinguish between inorganic and organic adaptation, and will deny intelligence to the inorganic.

B. ADAPTATION IN THE ORGANIC WORLD.

1. Primary mechanical types.

a. Tropic adaptation.—There is a difference of opinion as to where to draw the line between tropism and real reflex or instinctive acts. The view here taken will be that which limits tropism to those organisms which lack a differentiated nervous system.* Such primitive organisms possess a generally diffused sensitiveness of the total protoplasmic mass. This sensitiveness promotes simple adaptation, but these adaptations have much of the same invariable (and therefore predictable) character as do the adaptations in the organic world. Water, light, and heat have been spoken of as having certain mechanical effects upon inorganic substances. They have also a total mechanical effect upon organic tissue, and through this effect may promote adaptations. But again, the body (even though it be organic) is *adapted to* the environment, it does not adapt itself. Again there is no active, inner, selective factor, no initiative, which interferes to make the prediction of variation uncertain. Hence in one sense there is no variation at all, and certainly no intelligence.

b. Reflex and instinctive adaptation.—In inorganic adaptations and in tropism there is assumed to be no intelligence, since it is conceived that in them the adjustments lack spontaneity, and are practically predictable. The body is at the mercy of its own material composition as acted upon by external agencies. But with instinctive adaptation it is different. Instinct utilizes a differentiated nervous system and succeeds in being less rigid, less predictable, and more selective, though the selection occurs in a mechanical manner.

Herrick says that theoretically the simplest organized nervous response is the reflex which depends upon merely the simplest re-

* Whether or not this includes plant life is a somewhat mooted question; but the essential facts of the present discussion will not be unfavorably affected if this question is dropped, and the matter discussed wholly from the point of view of the animal organism.

ceptor and effector organs, and one motor and one sensory neuron. He says further than some writers have been willing to classify such reflexes with the tropisms; but that others conceive the pure reflex as more theoretical than actual, and tend to move immediately from unorganized tropism to the instinctive response regarded as a group of reflexes. The latter view will here be taken.

From one point of view the organized nervous response known as instinct, is entirely mechanical, prearranged. It is regarded as a selective or choosing agency, yet as selecting those stimuli, only, to which it is tuned to respond mechanically, and as always responding in the same way to the same stimuli. It is thought of as rejecting or ignoring the different; but when a stimulus comes which is similar to that to which it was meant to respond, and to which it has always responded, it is conceived as responding again in the same way. This view is only relatively true. The organism which responds instinctively through the aid of a nervous system is not so rigid and invariable in its adaptation to environment as are inorganic bodies, or even those creatures that depend upon tropisms. The nervous mechanism permits a certain limited initiative or self-adjustment in adaptation, although one must hasten to say that self-adjustment is not here used in the sense of purposive or intentional adjustment. There is merely a mechanical selection, based upon limited possibilities residing in an originally organized mechanism. Birds of the same species build similar nests; but no two of them build nests exactly alike in all particulars. No one conceives that the bird intentionally selects the changes. The power of selection lies in the elasticity of the mechanism, and this elasticity is limited. Yet to this limited degree the creature of instinct does influence its destiny through the exercise of an active, inner, selective factor; and to this degree its variation is non-predictable. The organism in a measure adapts itself, and is not *adapted to* its environment. This has led many to wish to use the word intelligence to apply to these mechanical variations in instinctive behavior. There is a limited sense in which the word might be so used. A problem has really been solved through focus upon a situation,

plus action which is based upon selected (chosen) similarities. But the control in the whole process is mechanical and not intentional; and if the term intelligence is applied, it needs to be qualified by emphasis upon the mechanical control. This type of mechanically controlled intelligence, this plasticity in original instinctive response, is unlearned, and in that sense non-productive. Only original neural patterns are called upon; but there is a limited mechanically controlled choice between persistent originally arranged systems woven between the neurons which are the units of the nervous system.

c. Modified instinctive adaptation.—But original instinctive response does, at times, through the mere conflict of the original mechanical systems, cease to be the only resource of an organism. As an illustration it may be noted that an organism may have an original system of response which makes it tend to avoid pain through withdrawing movements. It may have another original system which leads to approaching movements in the presence of a bright object, e.g., a hot stove. The mere mechanical conflict of these two systems may lead to the suppression of one of them and to the supremacy of the other.

The characteristics of this type of adaptation are very similar to those of original instinctive adaptation. The choice is on the basis of similarities; and a problem is solved, although there is no formation of new neuron patterns. The variation is also less predictable than in tropisms or in inorganic adaptation. The organism is not merely *adapted to* environment. To a degree it has initiative and it adapts itself. There is an inner, active, selective agency at work, but the control exercised by this agency upon the destiny of the creature is mechanical and not intentional. If there is intelligence, it is still mechanically controlled intelligence. Learning may be said to have taken place, because the variation, unlike that in original instinctive response, is not merely a mechanical choice between persistent possibilities, but is the result of a permanent suppression of one original tendency in favor of another original tendency. Thus the act is productive mechanically controlled intelligence.

d. Associative adaptation.—In the types of adaptation thus far

noted, no new neuron systems are formed. There is often, however, an excess neural discharge. This comes especially in times of emotional excitement. Many random movements are then made as the excess discharge forces itself through new channels. If discharge through a new channel brings satisfaction, the new movement is associated with it, and this movement comes more certainly the next time. Thus gradually new neuron patterns are formed and behavior is varied; problems are solved; learning takes place. This learning utilizes the neural-switchboard, and shoots upward to a sensory-motor level above the level of the mere reflex arc; but it does not go high enough to get into the level of intentional control. It is at first a chance choice due to mechanical spontaneity, and it is continued as a mere mechanical association with a sense of well-being.

Even rote learning of a song or other school exercise may occur in the way just described; and many common manners and customs also have the same origin. The problem is not intentionally or logically attacked; but repetition, plus a favorable affection, blocks out the new pathways, and establishes the new neuron bonds or patterns. It is only trial and error learning, or incidental learning. Yet the creature is not merely *adapted to* its environment. It adapts itself, although in a mechanical manner. Therefore the word intelligence is applicable if the act is realized to be an example of mechanically controlled intelligence. Mind, if present at all, is still not a directive agent. In popular terms, a mechanical habit has been mechanically formed. This type of adaptation is the least predictable type thus for discussed.

2. Purposive Type.

a. Intentional adaptation.—There have been discussed two types of unintelligent adaptation: (a) the inorganic adaptation; and (b) tropism. There have also been discussed three types of limited-intelligent adaptation: (a) original instinctive adaptation; (b) modified instinctive adaptation; and (c) associative adaptation. But there comes a time in the life of an organism when none of these types of adaptation can meet the new situation

which is presented. When such a time appears, the organism suffers, or even perishes, unless it is an organism possessing a mind which can break in to solve its problem by influencing the nervous currents to the formation of new neuron patterns necessary to a new adjustment intentionally chosen out of the possibilities which the situation presents.

The theory involved in the interference of mind in the formation of new systems of response has already been briefly outlined. It is that there must be involved a certain grade of refinement of the nervous structure found only in the cortex, and a certain intensity of the neural activity in the cortex, before the limen is passed and the mental life is able to function. That is to say, that mind is coextensive with (1) a certain intensity of neural activity, and (2) in certain structures. One of these conditions alone is not enough. Mere intensity in the lower structures, or mere activity in the cortex, must give place to *a certain intensity in the cortex* before the limen is passed. (But it is conceivable that cortical activity which is not intense enough to pass the limen may have an indirect mechanical influence upon mind, through its influence upon the cortex.)

Below the limen, therefore, is mechanically controlled adaptation. The function of this intentional activity of mind is to meet those emergencies in which the mechanical systems break down. Asuming that mind is able to do this, a certain analysis may be made of the method. This analysis cannot fail to be rather rigid and dogmatic, but it is not intended to be inflexible. All discussion of types must attempt to make the type specific as if it stood out sharply by itself, even though in reality it grades imperceptibly into adjacent types. Purposive adaptation does not always appear unadulterated; but, theoretically, in its pure form, it presents the following named elements, each one of which is to be understood as intentionally carried out:

1. Focus upon possibilities; in other words, concentration, or attention.

2. Pause; the mechanical currents must be temporarily inhibited.

3. Selective activity; significant elements in present and past situations must be abstracted and held by themselves.

4. Relating of the selected elements.*

5. Action upon the relationships discovered.

When the literature is examined in the next section it will be found that the modern tendency is to reserve the term intelligence for this type of adjustment, or adaptation, which solves problems by the steps just enumerated. However, if one has decided to use the expression "mechanically controlled intelligence" for unintentional adjustments, he can use a qualifying term for these directed adaptations, and call them "intentionally controlled intelligence." They may also be called productive intentionally controlled intelligence, since they really produce new connections, and new behavior.

This same type of adaptation has other names such as intentional learning and thinking. It represents the height of power of the active, inner, selective factor which produces non-predictable variation. It is the means by which the organism escapes being merely *adapted to* its environment, and succeeds in *adapting itself* to the environment, or in adapting the environment to itself. It is the open door to controlled progress.

Throughout this thesis therefore there will be made an attempt to separate the various aspects of mechanically controlled adaptation from intentionally controlled adaptation. The following list of terms wll help to insure this separation:

Inorganic adaptation (unintelligent).
Organic tropic adaptation (unintelligent).
Non-productive mechanically controlled intelligence.
  a. Original instinctive adaptation.
Productive mechanically controlled intelligence.
  a. Modified instinctive adaptation.
  b. Associative adaptation.
Productive intentionally controlled intelligence.

*What kinds of relationships is the mind able to conceive? Cause and effect, time, space, genus-species, part-whole, likeness and difference; how many are there to be found? Can all be reduced to one; viz., similarity? Time relationships are gathered because they are similar; so with place relationships, etc. Then ability to relate becomes just that ability which is able to recognize in present experience an element similar to one belonging to a past experience.

3. Secondary mechanical type.

a. Reproductive (habitual) adaptation.—It is well known that an act which once required the immediate, purposive supervision of mind, may, through repetition and other circumstances, fall back to be performed by new-formed mechanical-neural systems. Mind is thus released for new ventures in new fields. The act that is thus relegated to mechanical systems is no longer an intelligent act in the sense of intentionally controlled intelligence. It is intentionally controlled intelligence only in so far as it has not been so relegated. The process of relegation consists in a gradual fading away, out of the focus of mind into the fringe. The act thus becomes more and more predictable, and finally drops entirely below the limen into the mechanical, the unintelligent, or the mechanical-intelligent, if one wishes to use this term. It becomes habit, and, for the purposes of this discussion, belongs with the mechanical adaptations. In this connection it can, through mechanical conflict with other mechanical systems, bring about mechanical learning, just as in the already discussed conflict of two original mechanical systems.

But this act which was once intentionally controlled, and has now become mechanical, has not at all the same significance as the original mechanical. It stands not only for mechanism, but it stands also as evidence of a former exercise of intentionally controlled intelligence. It can be brought back into the intentional; and it could not have been performed at all without the original exercise of the intentional. It is, therefore, secondary evidence of intentionally controlled intelligence, since in all probability, the formerly exercised power still persists in the organism. And this secondary evidence often has an importance nearly or quite equal to the primary evidence afforded by a new adaptation itself.

This secondary evidence of intentionally controlled intelligence, this giving back of something learned at a previous time, may be called pedagogical intelligence, or reproductive intelligence. It is the diary of the intentionally controlled intelligence.

III. The definition of intelligence.

It has been customary among students of intelligence to say that it is not known what intelligence is. The view taken here is that what has been meant is that types of intelligence have not been discriminated, or that the fundamental nature of intelligence has not been known; but that it has been known what intelligence is, and that the preceding discussion has shown what it is. To accomplish this end did not require experimentation, but only an examination of the usage of the word. For any term has content only through usage, and that usage may give it any content whatever. It has been shown that the usage of the word intelligence has been rather definite, except that types of intelligence have been allowed to overlap. It follows that the definition of intelligence should be broad enough to include all types admitted by usage, and that supplementary definitions of the individual types should be given. The broad and all-inclusive definition may be worded as follows:

AN ORGANISM IS INTELLIGENT WHEN IT POSSESSES THE ABILITY TO INFLUENCE ITS DESTINY THROUGH THE UTILIZATION OF AN INNER, ACTIVE, NON-PREDICTABLE, SELECTIVE FACTOR WHICH CHOOSES ON THE BASIS OF SIMILARITY.

This definition, since it includes mechanical choice, does allow intelligence to practically all animal organisms; and that is just what some writers of importance wish to do. If, however, one wishes to distinguish intentionally controlled intelligence as a pivotal type (and this is the only type which many writers recognize) he must make a more qualified definition as follows:

AN ORGANISM HAS INTENTIONALLY CONTROLLED INTELLIGENCE WHEN IT POSSESSES THE ABILITY TO INFLUENCE ITS DESTINY THROUGH THE INTENTIONAL UTILIZATION OF AN INNER, ACTIVE, NON-PREDICTABLE, SELECTIVE FACTOR TO EFFECT A SPECIFIC PURPOSE THROUGH INTENTIONAL CHOICE BASED UPON SIMILARITIES.

IV. Summary of Chapter II.

1. It is agreed that the problem of intelligence is within the problem of adaptation.

2. But adaptation is in no sense intelligent until a body utilizes an inner, active, non-predictable, selective factor to influence its destiny. Hence inorganic adaptations, and even organic tropisms, are not intelligent.

3. Organized response may be mechanically controlled as in (a) original instinctive adaptation; (b) modified instinctive adaptation; (c) associative adaptation. If these are regarded as intelligent at all, it can only be in a limited sense, and they should be known as mechanically controlled intelligence.

4. Organized response may be intentionally controlled. This is the type of adaptation generally recognized as intelligent. It is intentionally controlled intelligence in contrast to the mechanical control. Its variation is relatively non-predictable.

5. Intentionally controlled intelligence may lapse into mechanism, and become a secondary mechanical type, valuable as the diary of the intentionally controlled intelligence.

6. Intelligence may, therefore, be defined as in Section III of this chapter.

CHAPTER III

Types of Studies in the Quantitative Determination of Intelligence.

The lack of discrimination between the types of adaptation discussed in the last chapter, has naturally encouraged looseness in discrimination between types of experimental studies of intelligence. There is also an added difficulty arising from the tendency to claim that one has measured intelligence when, in reality, he has not done so at all, but has only measured some trait correlated with intelligence. These points will be covered very briefly in the present chapter, the latter being taken up first.

I. Measures, not of intelligence, but of factors found to be correlated with intelligence.

A. CORRELATION OF PHYSICAL TRAITS WITH INTELLIGENCE.

If it is found that intelligence usually goes with a head of a certain width or length, then the measuring of the heads of a group of people may give an insight into the probable amount of intelligence in the group. But, in spite of this, it cannot then be truthfully said that the intelligence has been measured. The presence of intelligence has only been inferred as a result of the head measurements. In one sense the result is the same no matter how it is stated; but, if, in such a case, intelligence is really thought of as measured, false ideas as to the true nature of intelligence are fostered.

Good examples of the measurement of physical traits correlated with intelligence are found in the early part of the first volume of Whipple's "Manual of Mental and Physical Tests". First are certain anthropometric measures, such as have often been used in the identification of criminals, and in the relation of growth to disease, etc. Definite degrees of these traits have also been found

usually to be associated with intelligence, and the presence of the given degree of the trait therefore leads to the inference of the presence of intelligence. Examples of such measurements are those of height (standing and sitting), weight, diameter of skull, girth of skull, etc. In like manner are utilized measures of vital capacity, strength of grip, physical fatigue, quickness of movement, accuracy of movement, and involuntary movement. The same thing also applies to measures of sensory defect due to physical conditions. Deafness, long- and short-sightedness, color-blindness, control of eye muscles, and such may be cited as examples. Any one of these traits may be found in varying degrees of correlation with intelligence or lack of intelligence. To measure the trait may lead to results which justify the assumption that intelligence will be found along with it; but it does not determine the degree of the intelligence either for the group or for the individual.

B. CORRELATION OF MENTAL TRAITS WITH INTELLIGENCE.

Studies which merely show that amount of perception, memory, etc., is correlated with intelligence, are not measures of intelligence itself. Again it will prevent confusion concerning the true nature of intelligence if such studies can be set off by themselves as the studies of physical traits have been.

It is common to think of a person of good perceptive power, good memory power, etc., as an intelligent person. But it has been repeatedly proved that even the feebleminded may possess these powers. The difficulty lies in the identification of (1) the admitted possession of the trait, with (2) the ability to manipulate the trait in the service of non-predictable variation. Percepts and memories are bundles of relationships. A person is not born with them. Hence their building up may be called variation; but, in the main it is a predictable variation. There is a natural course of events on the basis of which one could, if he knew all the circumstances, predict the formation of percepts, memories, etc., just as he could under similar circumstance predict the crystallization of steel under shock. This predictable variation, the main objective of the extreme "Behaviorist", is not

intelligence. Intelligence is not present until mental elements (functions) are, either mechanically or intentionally, brought into relationships which result in non-predictable variation. The real measure of intelligence measures spontaneity or initiative. It is true that in the formation of percepts, etc., there may have been present in a particular case some of this initiative (mechanical or intentional); but much of the process is likely to have been of the predictable kind; and one does not with certainty get at the spontaneity, therefore, through the measure of the function. The functions are prerequisite to intelligence, since the initiative can not come if the functions are lacking. But the functions may by measurement be found in varying amounts, and yet intelligence, non-predictable variation, be lacking, or at least unproved because it is obscured by the excess of predictable variation with which it is associated. If one wishes a reliable measure of intelligence he tests not the amount of the function, but the amount of initiative which the creature can produce through the discovery and utilization of relationships between the functions.

Examples of quantitative measures of sensation are the common tests of visual acuity (Whipple, Test 14), and auditory acuity (Whipple, Test 18), etc.; of perception, are the common tachistoscopic tests of range of visual attention (Whipple, Test 24), and visual apprehension (Whipple, Test 25), etc.; of rote memory, (Whipple, Test 38), etc. One may find these and other mental abilities correlated with intelligence; but the measurement of them is not a measurement of intelligence itself.

II. Real measures of intelligence.

A. MEASURES OF MECHANICALLY CONTROLLED INTELLIGENCE.

1. Original types (unlearned).

Here belong all those studies of endowment which aim to achieve a knowledge of the amount of a creature's orginal and unlearned ability to solve problems, e.g., non-predictable variations in the nest building of birds, in the migration of species, in the food habits of wild mice, etc. The variations here studied, however, are those which come within an original range of native

ability, and not those which supplant or augment original abilities. They are discussed in the former chapter under the head of original instinctive adaptation.

2. Learned types.

These are the ones previously discussed as modified instinctive adaptations and associative adaptations. They represent real non-predictable variation, but it is still of the mechanically controlled type. The field has been much exploited, and illustrations are numerous and well-known. Typical ones are the animal intelligence experiments of Lloyd Morgan, Thorndike, Yerkes, and Watson. All experiments in unintentional, associative, learning, or incidental learning in either human beings or animals belong here.

It may be said in passing that if the distinction between mechanically controlled intelligence and intentionally controlled intelligence were kept well in mind, much light would be thrown upon the dispute as to whether or not animals are intelligent. Animals do solve problems, but the consensus of opinion is that they solve them either through the small latitude of non-predictable variation allowed by instinct, or they solve them through conflict of instincts or through association. They do not solve them through working out of a deliberately chosen purpose based upon relationships intentionally sought between mental elements. From this point of view, animals have mechanically controlled intelligence, but not intentionally controlled intelligence.

B. MEASURES OF INTENTIONALLY CONTROLLED INTELLIGENCE.

Illustrations of intentionally controlled intelligence must be those featuring immediate and intentional problem solving. There can be included no primarily mechanical associative or instinctive processes. A new situation presents itself and is purposively attacked and solved through the discovery of new relationships. Cats get out of cages through mechanically controlled intelligence. A normal human being in the same situation uses intentionally controlled intelligence, and attempts purposively to

apply past experience to the present situation, find the similarities between the past and present, and so find the way out.

Some of the best developed modern single measure of intentionally controlled intelligence are certain tests of intentional sensory discrimination, certain picture-completion and other performance tests, the synonym-antonym test, the analogies, etc. As has already been said, this type of intentionally controlled adaptation is the only type that many writers are now willing to call intelligence; but it can do no harm to call mechanical phases of adaptation mechanically controlled intelligence, if mechanically controlled intelligence is definitely discriminated as a type.

C. MEASURES OF REPRODUCTIVE INTELLIGENCE.

The human mind is so constituted that after it has solved a problem once or several times, the solution becomes mechanical. At first there is required active attention and intention; later attention becomes what has been called secondary passive, intention drops out, and the act performs itself. It becomes reproductive intelligence because it reproduces mechanically the acts of the intentionally controlled intelligence. Many persons have not been willing to call pedagogical tests intelligence tests. It is true that a test in geography or history may require merely the mechanical reproduction of something previously learned; but the person may, and probably did originally, pick up much of the knowledge intentionally. And psychologists are more and more coming to believe that measures which determine how much a person has intentionally achieved through a term of years are often more significant than those measures which only find out his present achievement through a period of an hour more or less. So psychologists are not nearly so much afraid as they used to be of the pedagogical measurement regarded as an intelligence measurement. There is, however, a fundamental difficulty in the fact that one seldom is able to tell exactly how much of the reproduced material was originally acquired mechanically, and how much was acquired intentionally. Hence one cannot tell how much credit to assign to mechanically controlled intelli-

gence, and how much to assign to intentionally controlled intelligence.

Illustrations of pedagogical (reproductive intelligence) measures are those of arithmetical fundamentals such as the Courtis, series A and B; arithmetical reasoning, such as the Stone Reasoning Test; reading scales, such as the Kansas standardized reading tests; handwriting scales, such as the Thorndike scale and the Ayres scale; and the composition scales, such as the Hillegas scale, the Harvard-Newton scale, and the Willing scale. In fact one now finds such scales for practically every subject of instruction.

CHAPTER IV

The Fundamental Nature of Intentional Adaptation.

I. The "common factor" in intelligence.

Certain types of adaptation have been discriminated in previous chapters. Evolutionary tendencies in modern thought would naturally lead one to suspect a development from one type to another, but it is not the intention to pursue that idea at this time. It is now necessary, however, to call attention to the fact that the discriminations heretofore made between the non-intelligent, the mechanical-intelligent, and the intentional (purposive)-intelligent, are all based upon the conception of a "common factor" in intelligence. That common factor has several names such as seeing relations, thinking, judging, profiting by experience, etc.; and its exercise results in initiative, spontaneity, or non-predictable variation. Binet's own statement of this common factor is very significant, although he does not use it to make the distinctions herein urged. He says:* "It seems to us that in intelligence there is a fundamental faculty, the alteration or the lack of which is of the utmost importance for practical life. This faculty is judgment, otherwise called good sense, practical sense, initiative, the faculty of adapting one's self to circumstances. To judge well, to comprehend well, to reason well, these are the essential activities of intelligence. A person may be a moron or an imbecile if he is lacking in judgment; but with good judgment he can never be either." Hence it is here conceived that where the capacity for judgment and non-predictable variation is lacking, intelligence is lacking. It has also been shown that above the unintelligent, there is a level of mechanically controlled intelligence (original and acquired), marked by mechanical judgment; and above that, a level of intentionally

*The Development of Intelligence in Children, Vineland Laboratory, 1916; p. 42.

controlled intelligence, marked by purposive judgment. It may be pointed out that the discrimination between the mechanical-intelligence and the purposive-intelligence is a discrimination based not upon quantity of the common factor, but upon quality of that factor. Judgment, initiative, spontaneity, of a mechanical quality marks mechanically controlled initiative. Judgment, initiative, spontaneity of a purposive quality marks intentionally controlled intelligence. The remainder of the thesis will be occupied with attempts to determine the fundamental nature of the intentional or purposive type of intelligence, together with a consideration of the implications arising from the conclusions reached.

There are, of course, all degrees of gradation between a completely mechanical adaptation, and one which is completely intentional. It is even true that very many adaptations which on the surface are intentional, are at bottom a mixture of both types. But since the crucial importance of the intentional type as the key to directed human progress is acknowledged, and since it does, at times at least, occur approximately according to the rather schematic plan already outlined, it can do no harm to continue the discussion from that standpoint.

In the type of adaptation under consideration, mind is conceived to be an active factor. Through it a positive purpose of an individual is carried to its conclusion. It is a method of active solution of problems, through focus upon the possibilities of the situation, pause, selection of significant elements, and the recognition of relationships between the selected elements. But what are the elements between which relationships are found? They may be perceived material things, images of things, or symbols of things. With relation to any pair of such elements, thinking is possible. Each one of the pair is, as it were, held out by itself, and compared with the other. Then decision is made as to whether or not they belong together. But it is at first easier to do this when the objects can be obtained and handled (perceived) than it is to deal with images of the objects. And it is easier to deal with the images than it is to deal with symbols of the images or of the things themselves. Long before

there was any organized science of psychology the intuitive psychology of the people made its own statement of this fact by saying that it is easier to solve a problem in the concrete than in the abstract. It is the idea involved in this natural and fundamental usage which is to be here appealed to in attempting to solve the fundamental nature of intentionally controlled intelligence, just as usage was appealed to in former chapters to establish the definition of intelligence.

The relationship under consideration is apparent even in different degrees of development of the human race. The savage does not deal with abstractions so easily as with the concrete things that come to his hands. The average intelligent member of modern civilization who easily solves ordinary problems in arithmetic, finds himself baffled in the presence of the same problems put into generalized terms. Inevitably when thinking of these things one leans toward a genetic theory of development even within intentionally controlled intelligence itself. For although the mind acts as a unit in intentional control, it is nevertheless easy to believe that early in the evolution of this power, although all possibilities of mental action were potentially present, the unit-activity (function) of perception was predominant in problem solving. On this theory, progress has consisted in the gradual supplementing of the perceptual activity by other unit-activities involving images and symbols.

Moreover, it seems probable that this same progression roughly characterizes the life of the individual. It is probable that in his acts of intentionally controlled intelligence he deals easiest and oftenest with things, then with images of things, then with symbols. Upon this theory, feeblemindedness, which is now everywhere recognized as retardation in mental development, is a retardation in passing from the preponderance of one of these forms of activity to another. Thus the common factor, judgment, again asserts its power by determining levels even within intentionally controlled intelligence itself; and the person of low purposive intelligence is seen to be the one arrested primarily upon the level of concrete relationships, which his more fortunate mates pass on to the more ready manipulation of the image and

the symbol. But again it is quality, or type, of judgment, and not quantity, which determines the levels; although one is, of course, immediately interested in the quantity of the given quality which can be delivered.

But the conception of intelligence as arranged in levels, which levels are differentiated in terms of mental functions, or mental unit-activities, is not identical with that theory of intelligence which attempts to measure intelligence through mere quantitative measurement of each function. Binet, and many others, have shown very clearly that a person may have good memory, for example, and yet be unintelligent. Binet says:* "Just at the present time we are observing a backward girl who is developing before our astonished eyes a memory very much greater than our own. We measured that memory and we are not deceived concerning it. Nevertheless that girl presents a most beautifully classic type of imbecility." The point is that the memory is there, but that *the power to make non-predictable relationships between memories* is lacking. Thus, as shown in Chapter III, the quantitative measurement of the function is quite different from the measurement of power to solve problems in terms of the function. Yet the functions do determine the levels upon which the problem-saving may occur. To handle as many levels as there are functions, however (sensation, perception, imagination, etc.), attempts a minute classification which it is relatively impossible to achieve, because of the overlapping of the modes of activity. It is safer to condense the levels to three: (1) that of sensation and perception, (2) that of the image, and (3) that of the idea regarded as a symbol plus a meaning. Intentional adaptation (purposive problem-solving, thinking, learning) may take place through the relating of percepts, or of images, or of ideas.

Evidences which point toward the truth of this hypothesis are numerous in popular experience, and in the existing literature of intelligence. In fact the evidences are so clear that it is surprising that they have not hitherto been gathered up and applied to

* The Development of Intelligence in Children, Vineland Laboratory, 1916; p. 43.

the better understanding of the nature of intelligence, and to methods of measurement of intelligence. The steam has been lifting the lid of the kettle for a long time, but the significance of the fact has remained obscure.

II. Existing evidences that purposive intelligence is conditioned by levels based upon an analysis of mind.

1. The generally accepted idea that the abstract is "harder than the concrete".

Since concrete and abstract are only popular terms for the more technical psychological concepts of sensation, perception, memory, ideation, etc., the popular concept of degrees of intelligence is, therefore, seen to be in terms of a natural analysis of mind, stated as types of activity.

2. The popular, but contradictory, conception that pupils considered dull because they fail in abstract subjects, prove their intelligence by success in concrete subjects.

Over and over again, the child who cannot learn arithmetic, history, geography, etc., is assigned to manual training or other subjects in which concrete situations predominate, and succeeds in the new field. To say, however, that because of this success he proves his intelligence, is to go contrary to the belief that abstract subjects are harder than concrete ones. Even to say that one who fails in abstract subjects and succeeds in concrete ones has a different kind of intelligence, does not meet the point. He has also a different degree of intelligence. The progress of humanity, all the higher life of man, depends upon the control of the abstract. A civilization based mainly upon the concrete would be a civilization set back indefinitely. A person who lives mainly in the concrete is a person who has not the intelligence to enter fully into the life of the race to which he belongs. He has some intelligence, but it is only a limited intelligence. He lacks certain levels of ability which are possessed by the mind more capable of abstraction.

3. Courses of study in institutions for the feeble-minded.

The predominating type of material is perceptual. Manual training, and all of these subjects of instruction which tend to feature predominantly the concrete, form the bulk of the curriculum. Only the most elementary abstract work is attempted. (Thought work used consistently as pre-requisite to construction, could, and often does, raise the level of intelligence required by manual training, and make it a valuable study for modern schools. Then, however, the feeble-minded do not succeed in it so well.)

4. Clinical descriptions of typical feeble-minded persons.

These nearly always show the tendency to arrest in the territory of the concrete More than that they show that in concrete work such cases are, sometimes and even often, the equals or even the superiors of more intelligent subjects. That this is so, constitutes one of the most significant facts confirming the theory of intelligence herein advocated, since it shows that on the perception (concrete) level, high and low intelligence are much closer together than they are on the more abstract levels. Below is Doll's account of a typical feeble-minded case. The reader is asked to note how the concrete is emphasized in this case, both in the results of the mental tests, and in the subject's ability in manual and industrial work.

Doll: Clincal Studies in Feeblemindedness, Badger, 1917, pp. 81-89.

"Donald, born 4/14/95, was first examined 3/5/10 at the age of 14.9. By Goddard's 1910 revision of the B-S scale his mental age was 9.6 years. He passed all the tests at years VI and VII, failed memories at VIII and at IX, passed months and money at X, and absurdities at XI. Absolute retardation amounted to 5.3 years, relative retardation, 36 per cent. I. Q. was 64, and gave rise to a diagnosis of feeblemindedness, and a classification of middle grade moron. . . . Only extended and well directed conversation makes one conscious of his mental de-

ficiency; then, a poverty of ideas, a lack of originality, limited information, and vague comprehension of abstract relations are apparent. But these are subjective impressions of which most visitors who interview him seldom become aware. They stand out more definitely and clearly under observation in standard situations. . . . A formal pedagogical examination was not made, but school reports are now available. These show that he attended an orphan asylum school for two years, but made no appreciable progress. Furthermore, in spite of the exceptional advantages offered by the school department of The Training School, with its intensive and extensive individual teaching, he has never been reported as being able to do better than poor first-grade academic work. In music, and in manual and industrial work, he came to be one of the ablest of all the pupils. In particular he did well as a farm hand and learned to handle machinery, and to work with comparatively little supervision. He played well on the bass horn, both band and solo work, and although he was somewhat careless he had the reputation of being, under supervision, 'the finest industrial worker in the school'. . . .

Donald was examined by the writer 5/27/15, using Goddard's 1911 revision of the B-S scale. The result showed a mental age of 9.6, which was identical with the first and four succeeding examinations by different examiners. In these repeated tests he showed some losses and some compensating gains over the earlier tests but the gross results have always been identical. He passed all tests up to year IX. At X he failed to make change, saying that three cents from twenty gives sixteen, seven from twenty-five cents gives seventeen, and six from twenty gives eighteen, with the actual money before him. As an independent member of society he would be dependent upon the honesty of merchants or the kindly financial assistance of friends. At year X he exhibited only hazy knowledge of the pieces of money above one dollar (although he had had ample opportunity to know money values), failed in the abstract comprehension tests, and in constructing a sentence. At year 11 he succeeded with the rhymes, but missed all the other tests of that year. At twelve he passed only the suggestion test, and that in a manner to merit discount

on the basis of previous experience and memory. His failure in these tests could not be said to be due to lack of scholastic or other training, for he had been pressed to learn all that his mental ability enabled him to assimilate. . . . Thus all experience and observation with Donald confirm the diagnosis made in 1910. At the end of five years of intensive training in all fields of learning his mental capacity is the same as at the first examination. This case is typical of the milder forms of high-grade defect frequently met with in institutional experience."

5. Evidence drawn from the construction and the application of certain intelligence tests.

The evidence appealed to here will be that which shows that the power of the so-called "performance" material to differentiate mental age tends to decrease above the age of about eight years, and to reach its limit about the age of twelve years. By "performance" material is meant those tests which utilize concrete material and appeal mainly to sensation and perception. Form-boards, picture puzzles, etc., are typical examples, although the variation in the field is practically unlimited.

A. ILLUSTRATION FROM THE BINET TESTS.*

Most of the tests in the early years are either perceptual as in III(1), III(2), III(3), IV(1), IV(2), etc., or they are reproductive of something which has been picked up through the experience of much repetition and reproduced from memory. Examples of the latter are III(4), III(5), etc. But it is to be noted that such material decreases upward through the years, more abstract material is added, and more immediate solution of new problems is called for. By the age of ten the concrete material is practically gone except for X(3) (designs), and X(Al.3) (Healy-Fernald Puzzle A); and the problem with the designs draws heavily upon image states as well as upon perceptual states. It is true that in year XII one finds the Ball and Field problem which might be classed as a performance test; but the scoring in this year requires "superior plan", which means

*Terman, The Measurement of Intelligence, Houghton-Mifflin Co., 1916.

that a thoroughly logical and complete abstract conception must precede the performance.

B. ILLUSTRATION FROM THE DE SANCTIS TESTS.†

These tests constitute a graded series. Assuming that the correct materials are present, a rough notion of the procedure can be obtained from the following:

1. Give me a ball.
2. Which is the ball you gave me?
3. Do you see this block of wood? Pick out all the blocks like this from the pile on the table.
4. Do you see this block? (a cube). Point out a figure on the form chart that looks like it. Take this pencil (or pointer) and point out all the squares on the chart as fast as possible without missing any, taking the figures line by line.
5. Here are some more blocks like those you have pointed out on the chart. Look at them carefully and tell me (a) how many there are, (b) which is the largest, (c) which is the farthest away from you?
6. Do large objects weigh more or less than small objects? Why does a small object sometimes weigh more than a large one? Do distant objects appear larger or smaller than near objects? Do they only seem smaller or are they really smaller?

Determination of the degree of mental deficiency in accordance with the tests.

1. If the subject does not pass the second test the mental deficiency may be considered of a high degree.
2. If the subject cannot go beyond the fourth test, or if he makes many mistakes or is very uncertain in the fifth, the mental deficiency may be considered of a medium grade.
3. If the subject succeeds in five tests but finds the sixth difficult, the mental deficiency may be considered of a slight amount.
4. Finally, if the sixth test is completed without mistakes, the subject may be said to present no mental deficiency.

† De Sanctis, Mental Development, etc., Journal of Educational Psychology, 2, 1911.

Note (1) how the work in this series begins on the perceptual level in very uncomplicated form; (2) how the perceptual is gradually complicated; and (3) how the perceptual gradually gives way to the symbolic; and (4) how finally, in the directions for determining the degree of mental deficiency, the decision rests absolutely upon the ability to climb this ladder from the perceptual to the symbolic.

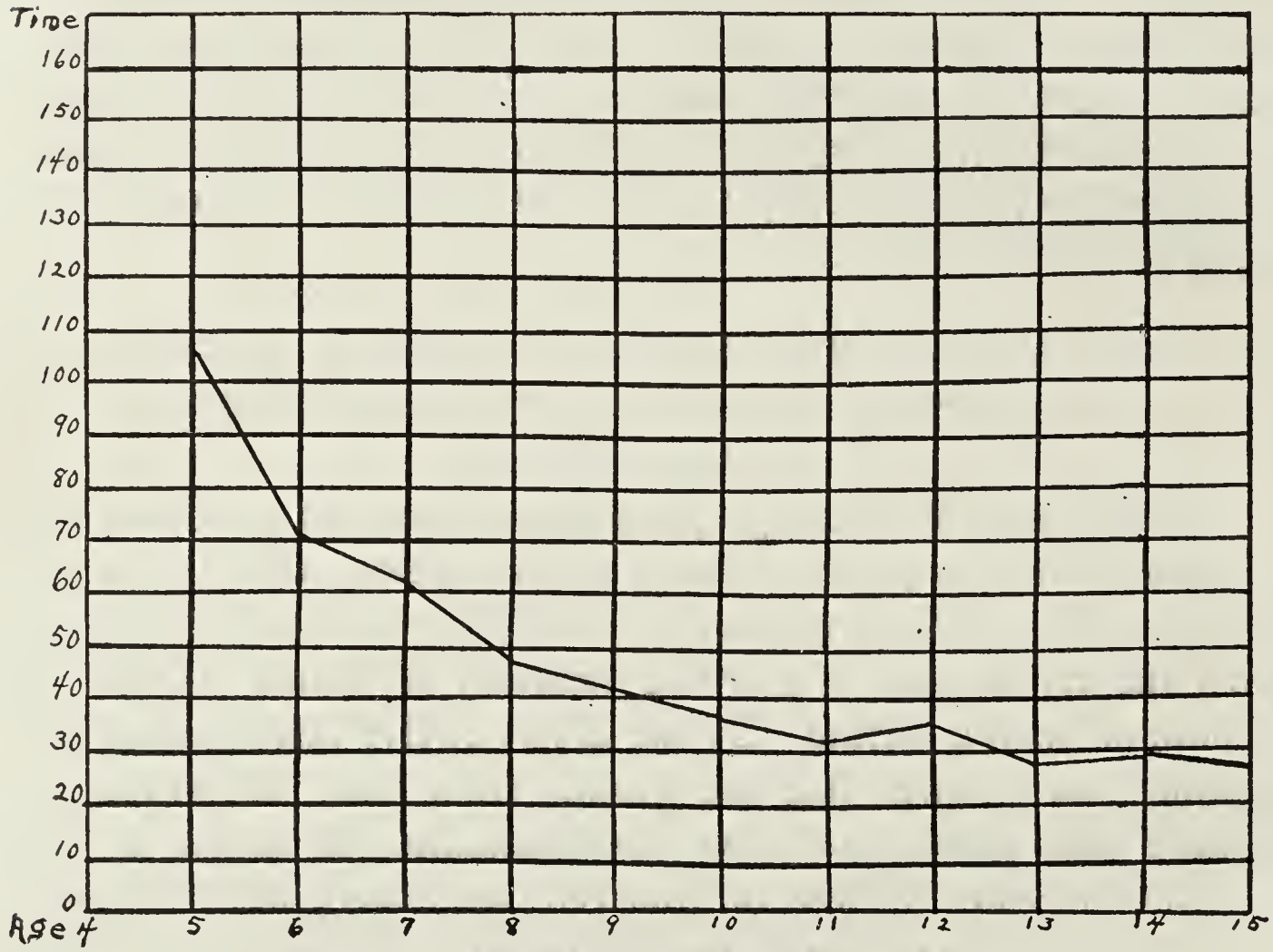
C. ILLUSTRATIONS FROM MATERIAL UTILIZED BY PINTNER AND PATTERSON IN "A SCALE OF PERFORMANCE TESTS" (APPLETON '11).

Examination of these graphs makes it clear at once that between five or six years, and nine and ten years, mental ages are fairly well, and in many cases very well, discriminated; but about ten the curves show a growing tendency to flatten out and to continue upon a plateau. By the age of twelve this tendency has gained such power that the graphs show little differentiation above that point, and where differentiation is shown by the graphs in years thirteen or fourteen, the experience of at least some of the users of the tests has been that results are not likely to be very reliable in those areas.

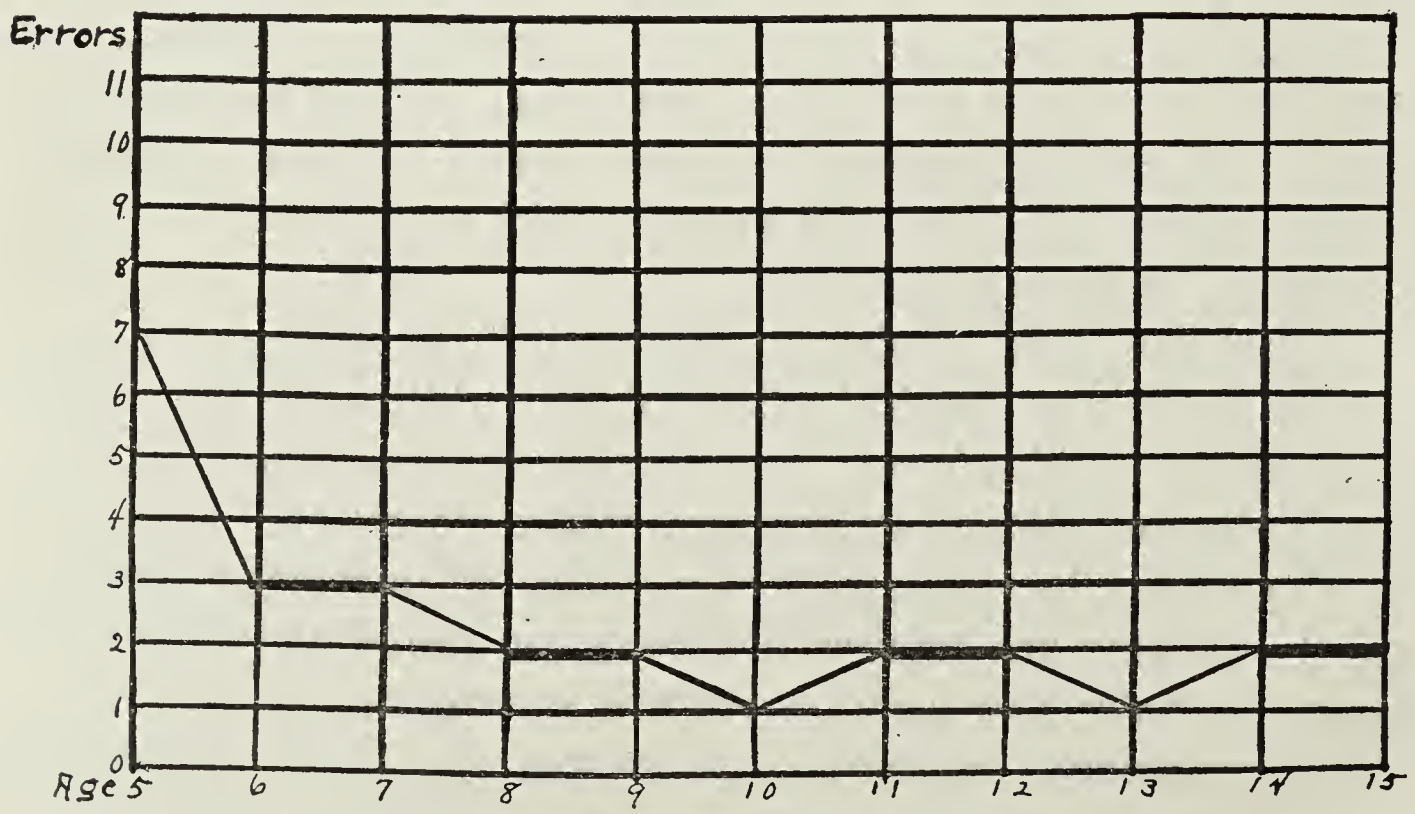
There is at least one exception, among the graphs, to the conclusion just reached. The reference is to the Knox Cube Test (Graph 27). This test shows better differentiation which may be referred to the fact that the discerning and holding in mind for repetition, of the increasingly complex series of responses, utilizes more than do the other tests powers which are superior to mere sensation or perception.

When one looks at the amazingly uniform tendency of performance tests to reach the limit of their differentiating power at a point roughly shown in the graphs, one must feel that it is probably more than a coincidence that a mental age of ten or twelve for adults has usually been chosen by intelligence experts as the dividing line between normality and feeblemindedness. It seems probable that performance test standarizations have, perhaps unwittingly, established the approximate point where abstraction must gain the ascendency, or subnormality become apparent.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

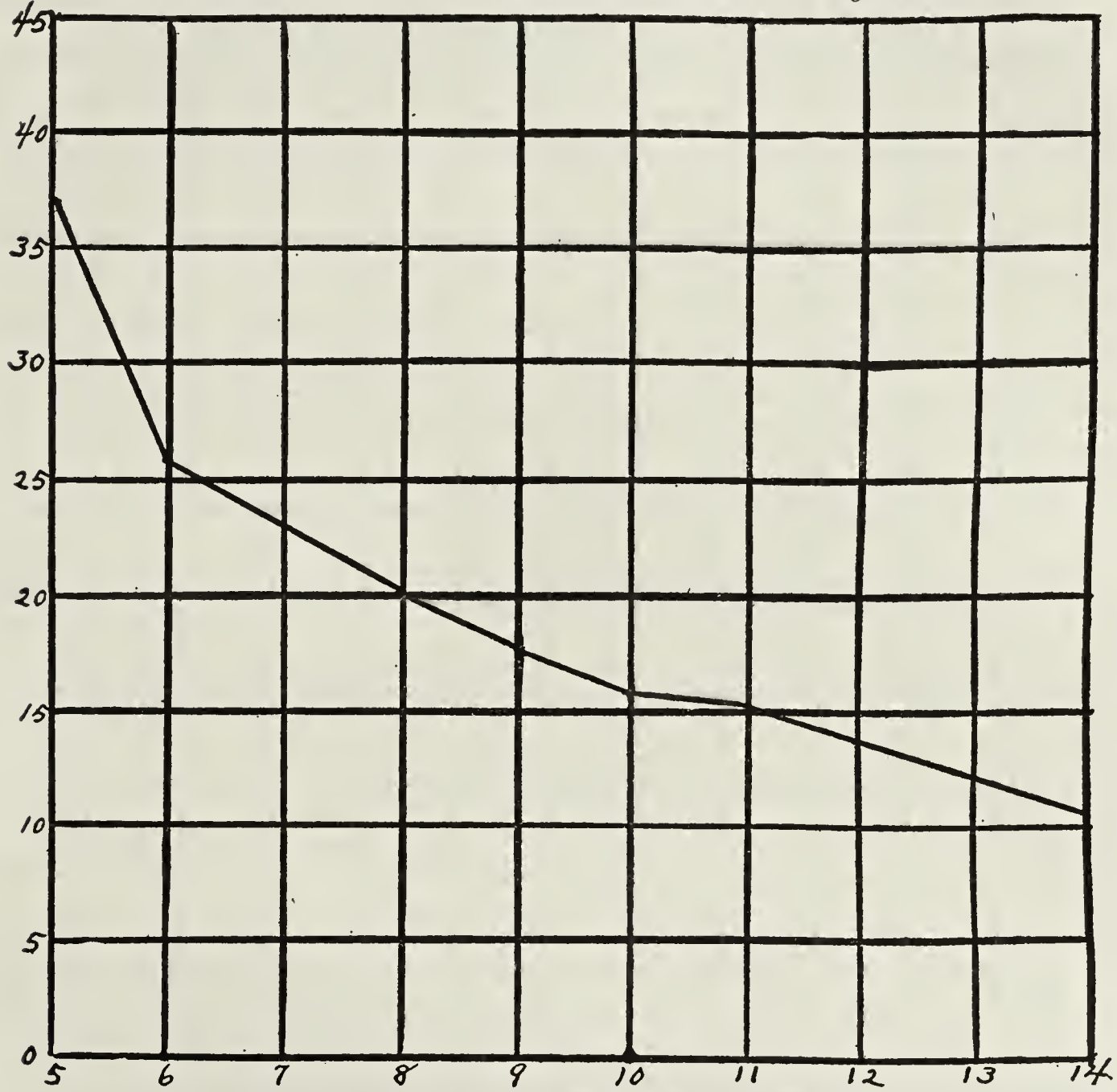


GRAPH 6. The Mare and Foal Test. Time.

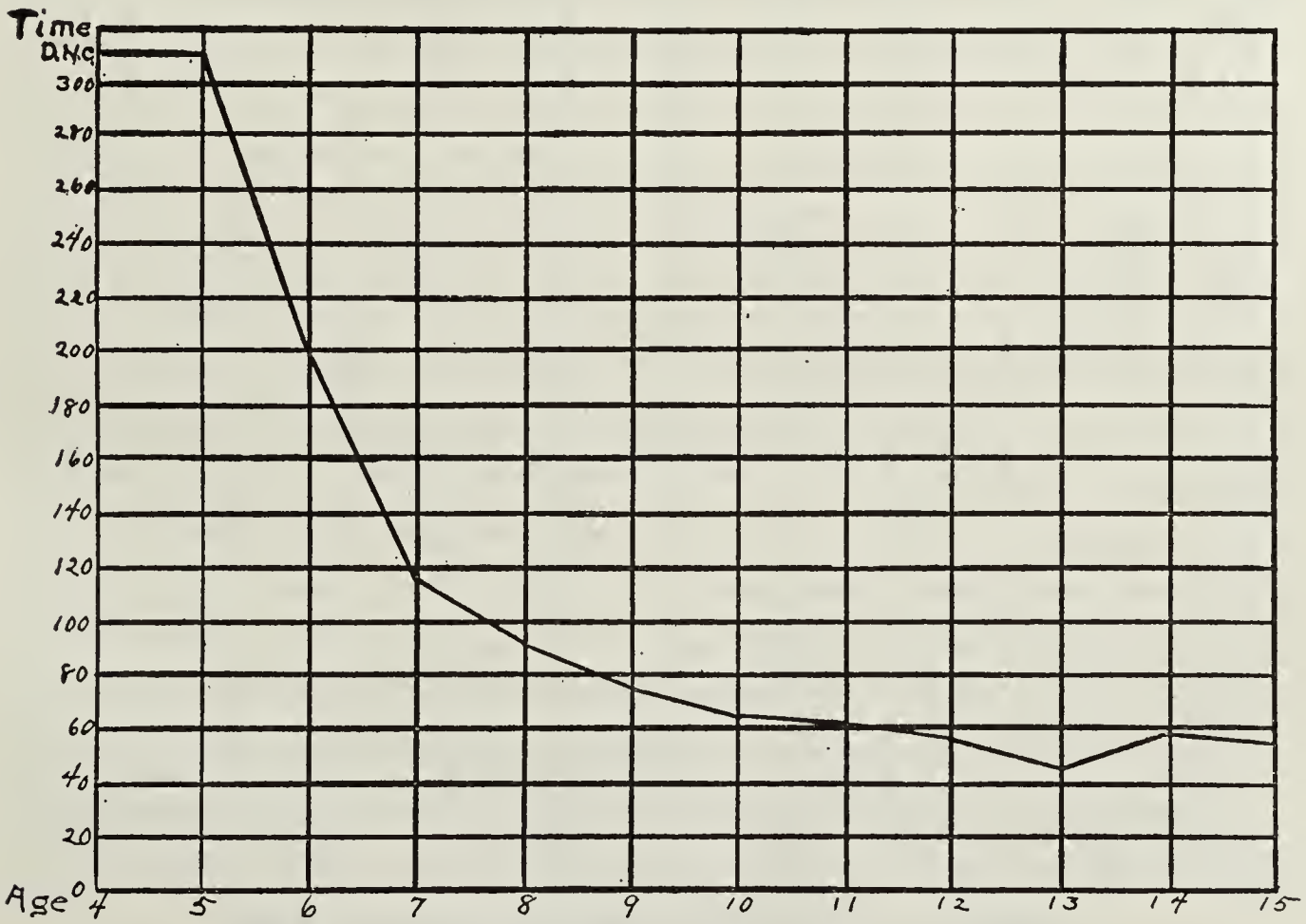


GRAPH 7. The Mare and Foal Test. Errors.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

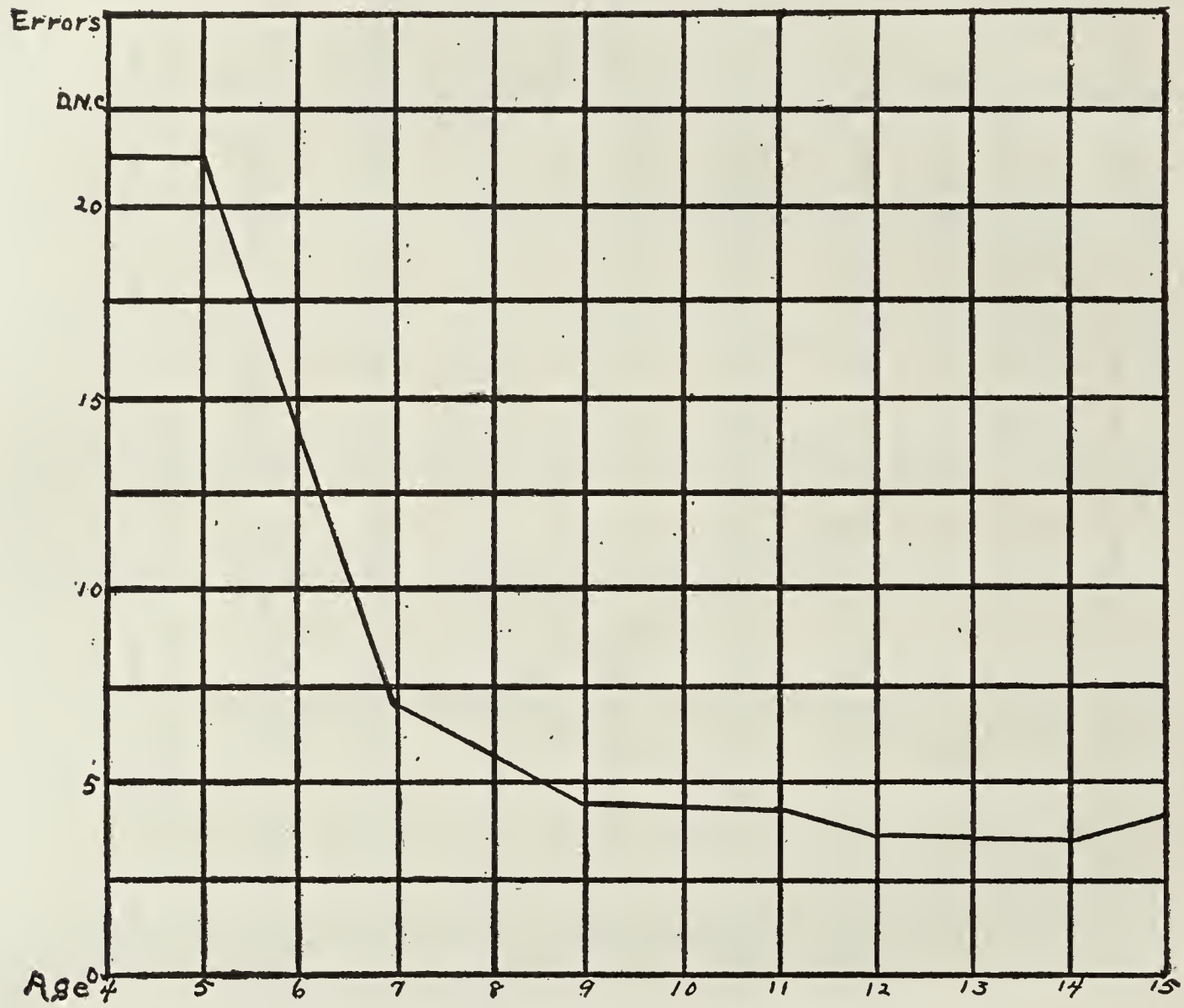


GRAPH 8. The Seguin Form Board. Time.

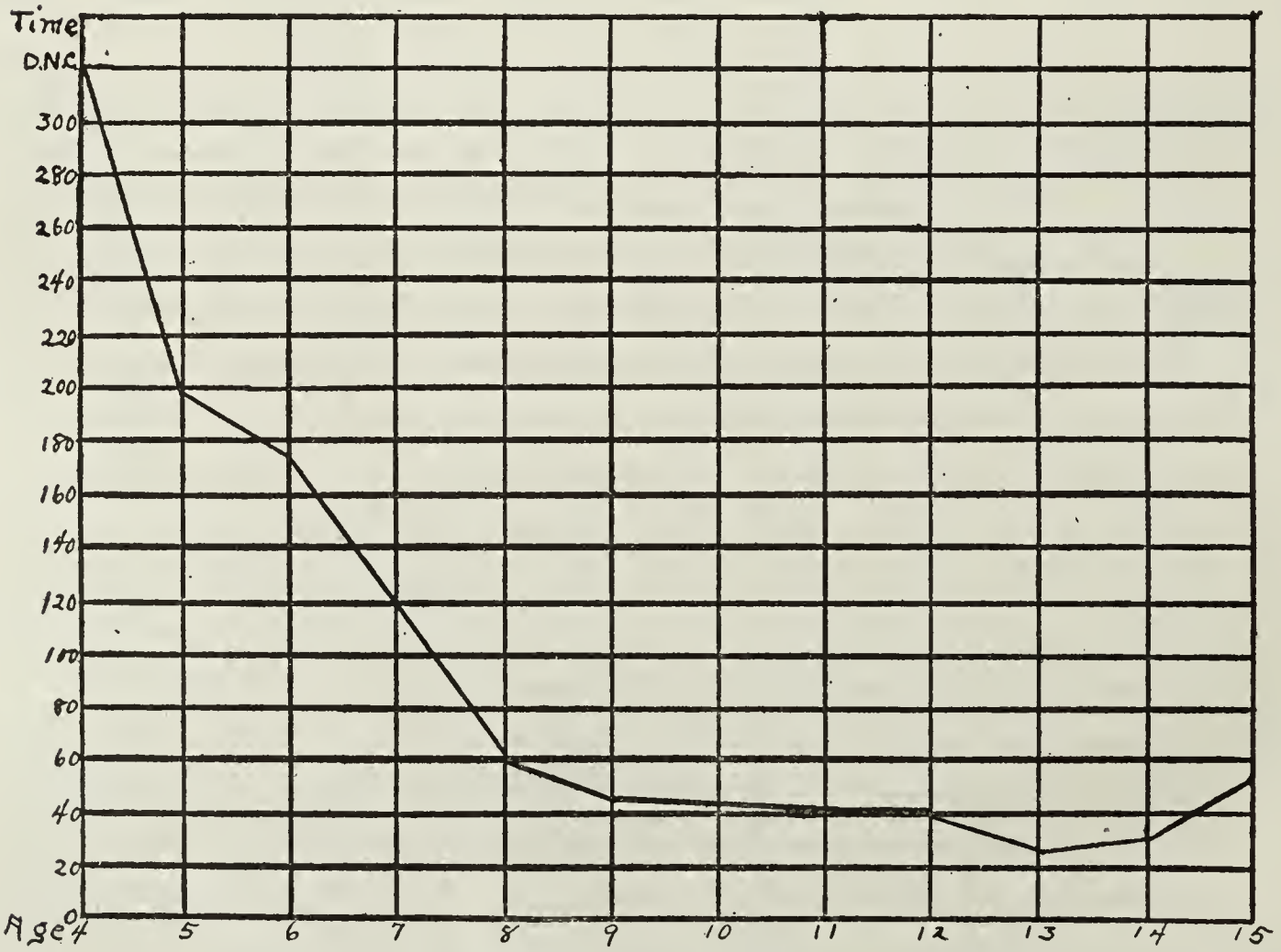


GRAPH 9. The Five Figure Form Board. Time.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

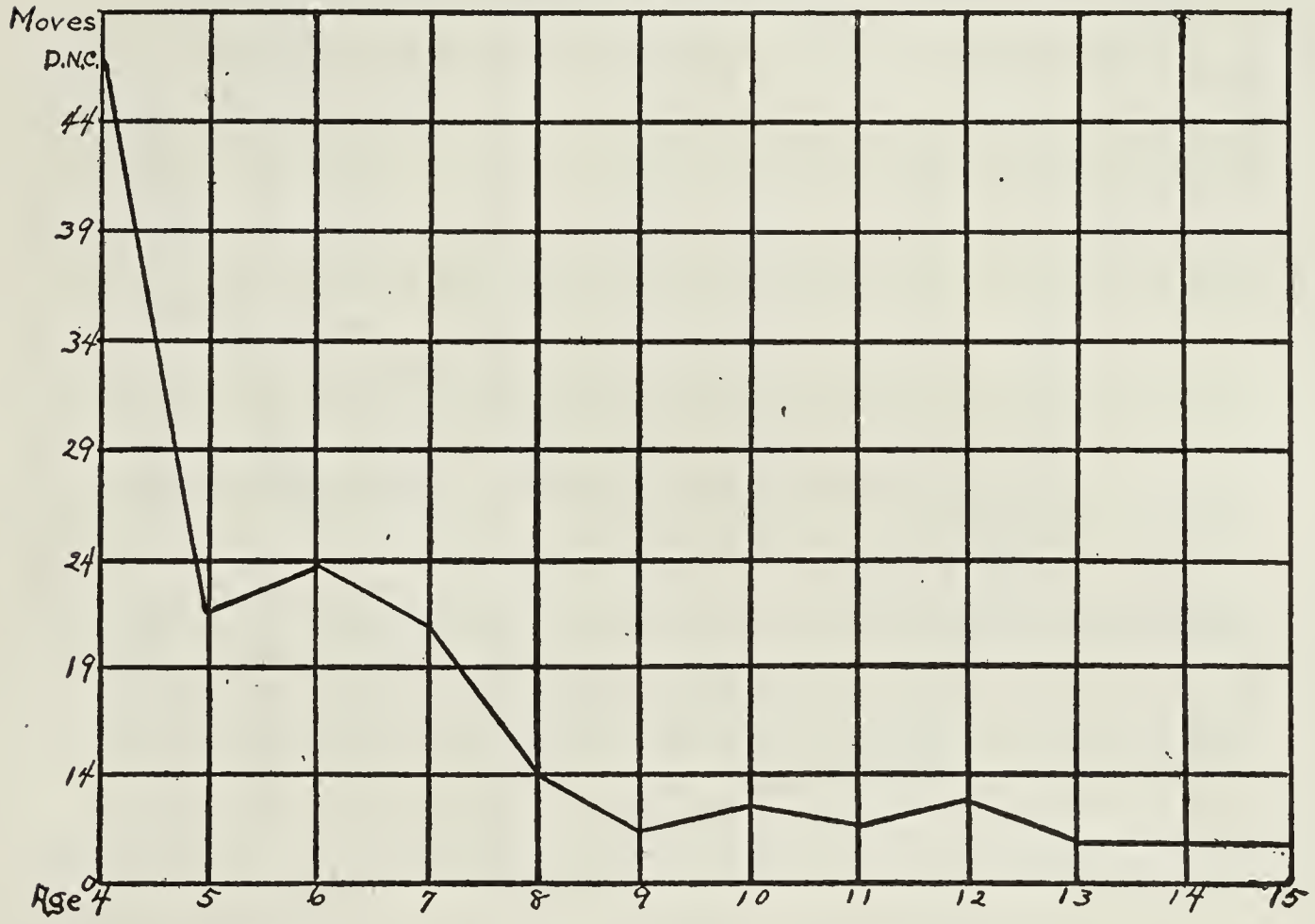


GRAPH 10. The Five Figure Form Board. Errors.

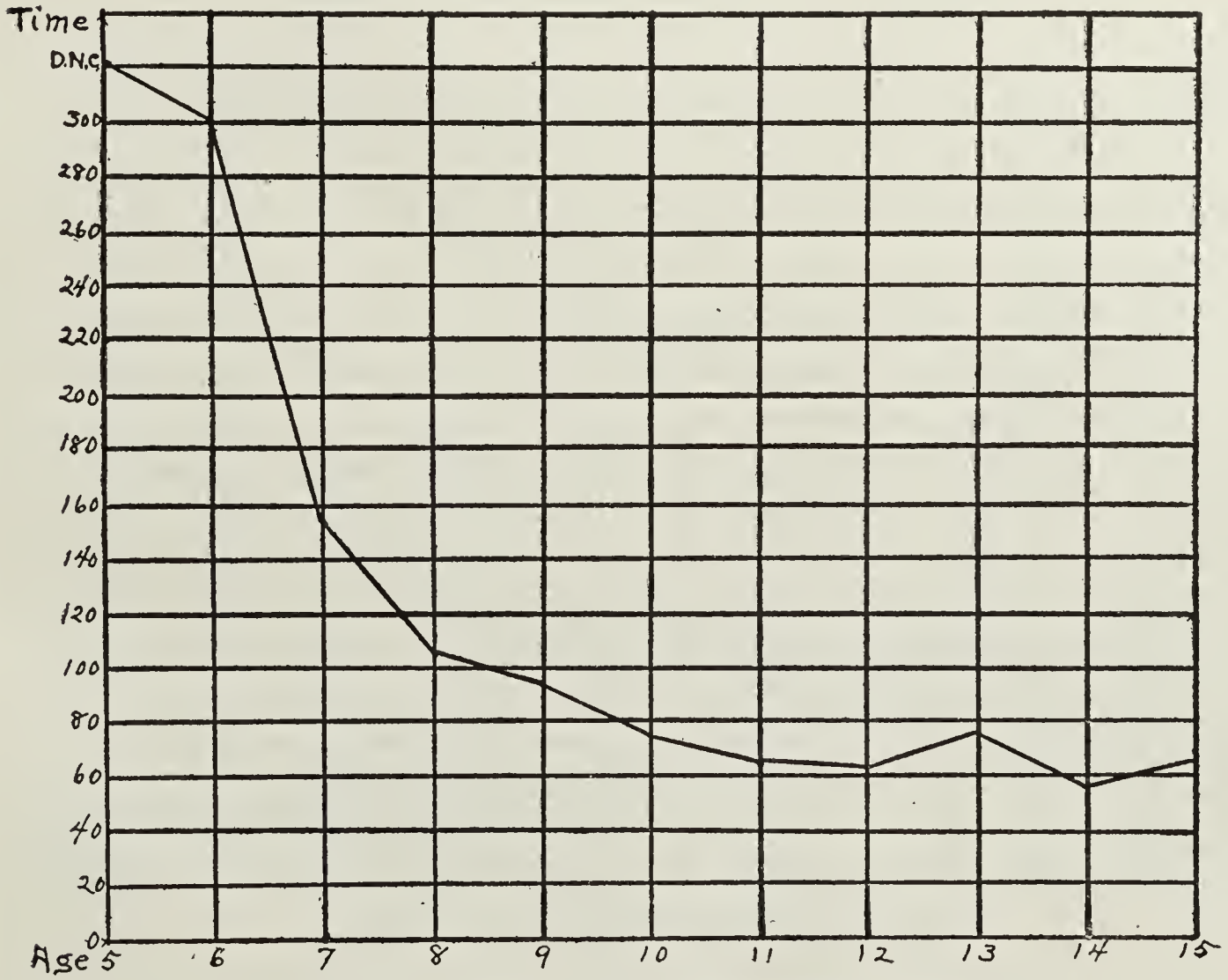


GRAPH 11. The Two Figure Form Board. Time.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

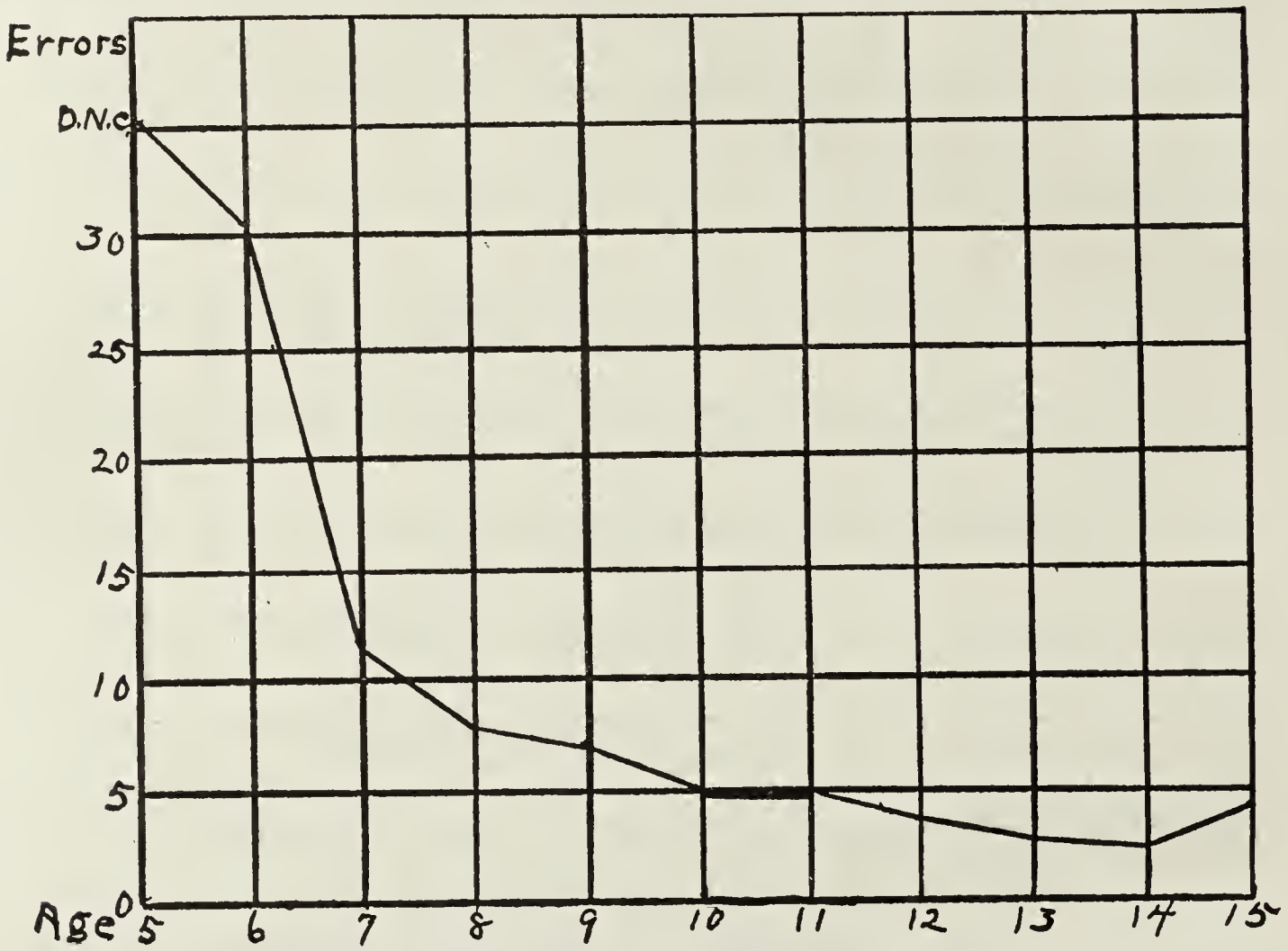


GRAPH 12. The Two Figure Form Board. Moves.

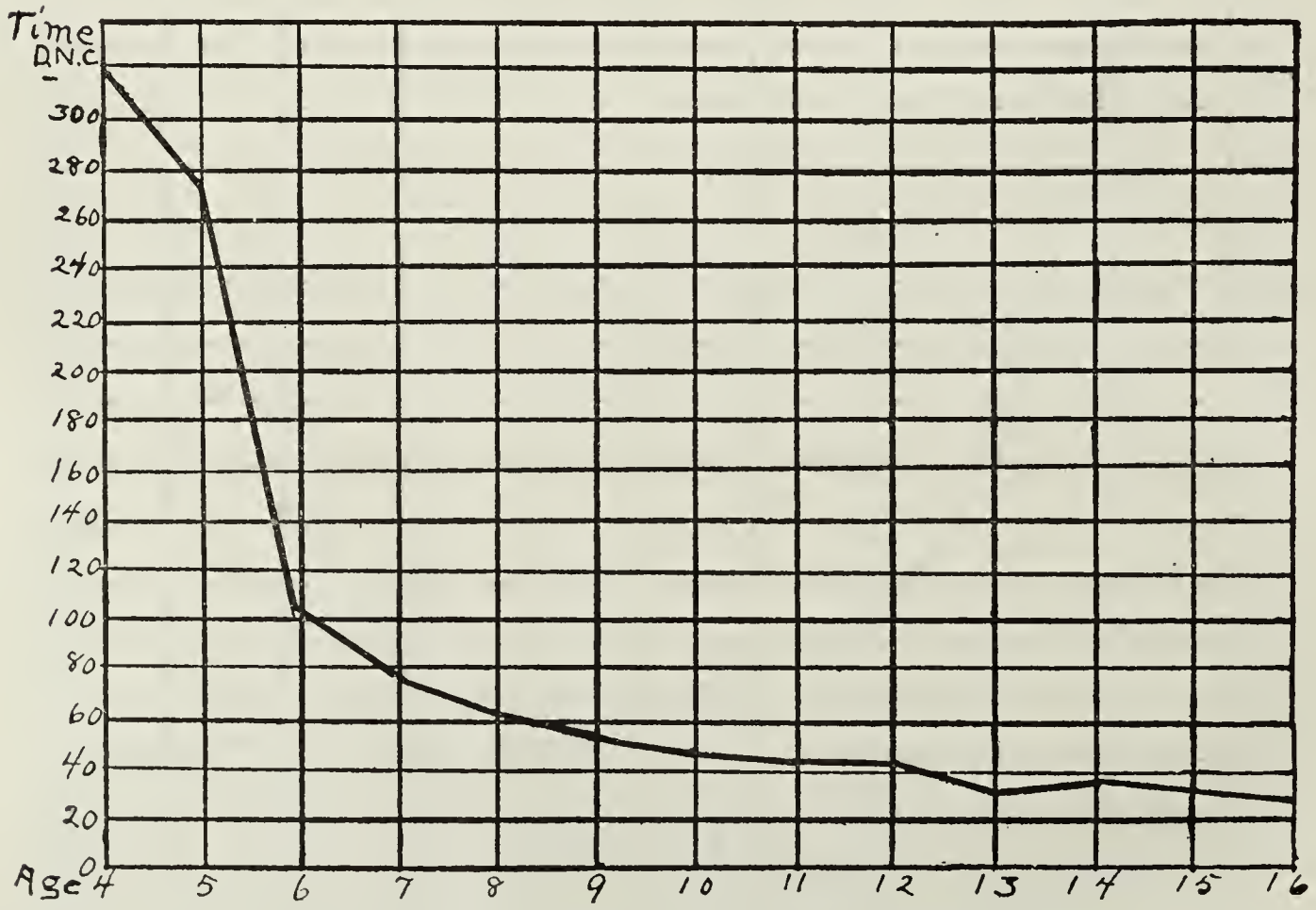


GRAPH 13. The Casuist Form Board. Time.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

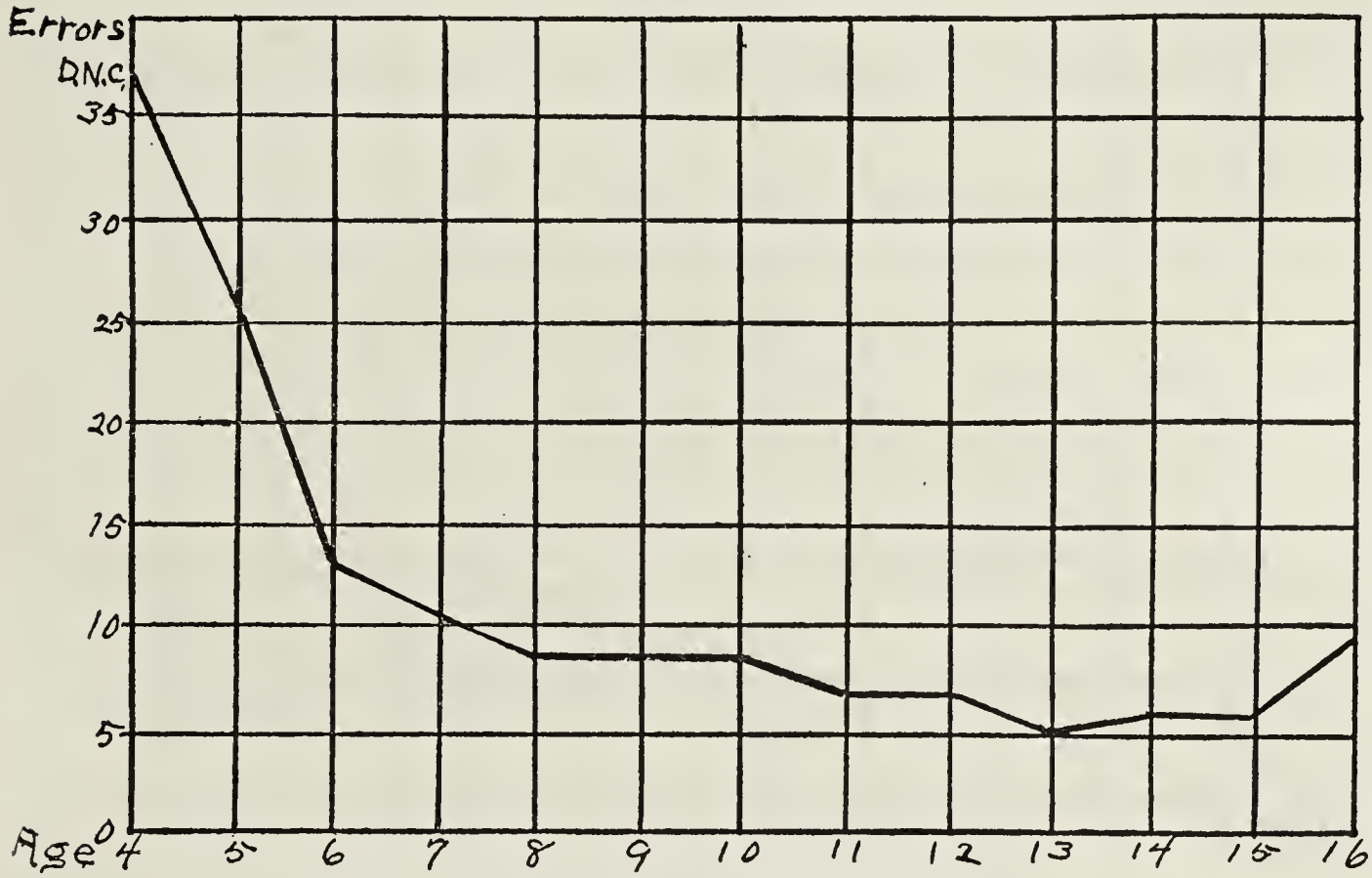


GRAPH 14. The Casuist Form Board. Errors.

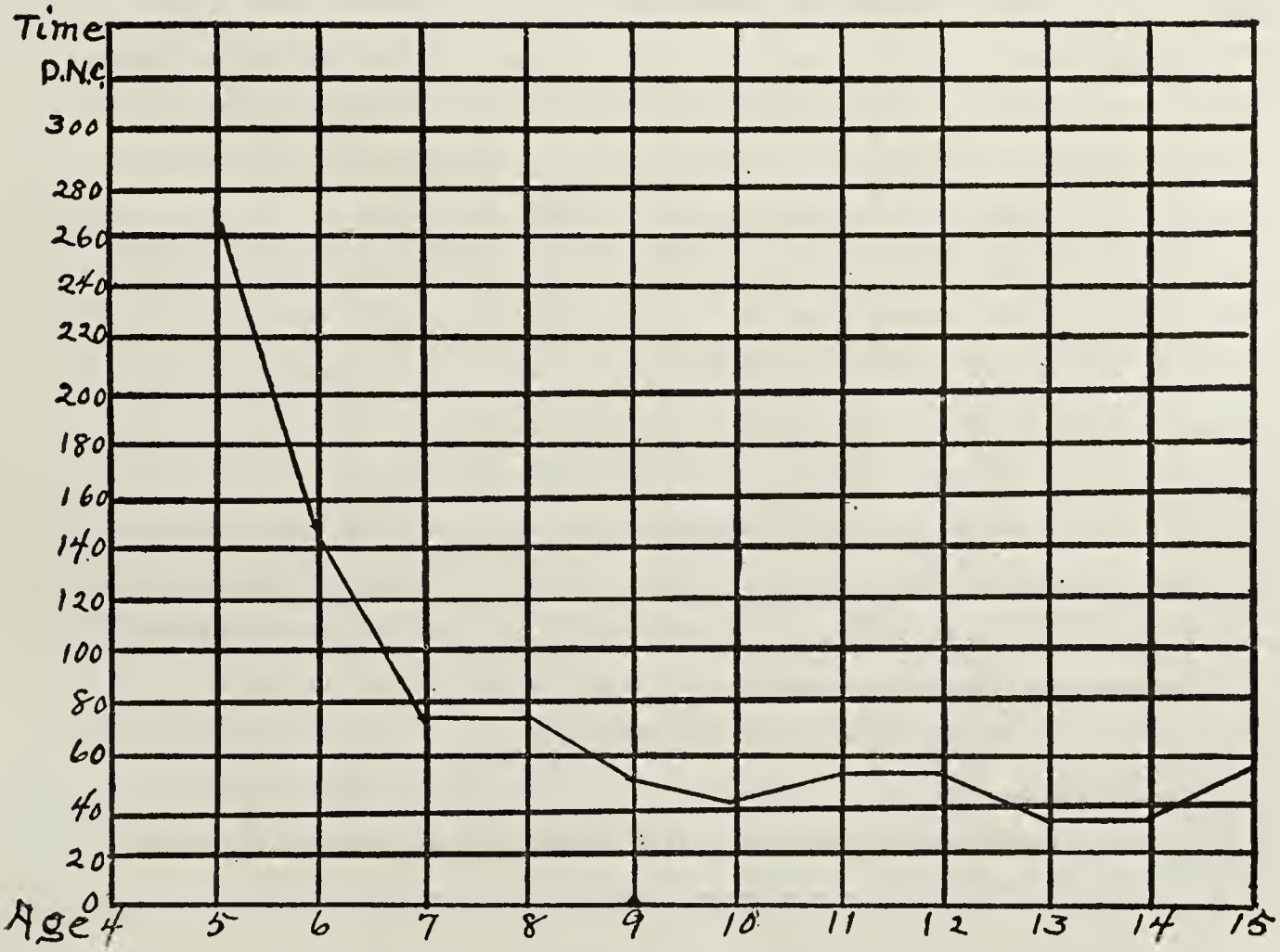


GRAPH 15. The Triangle Test. Time.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

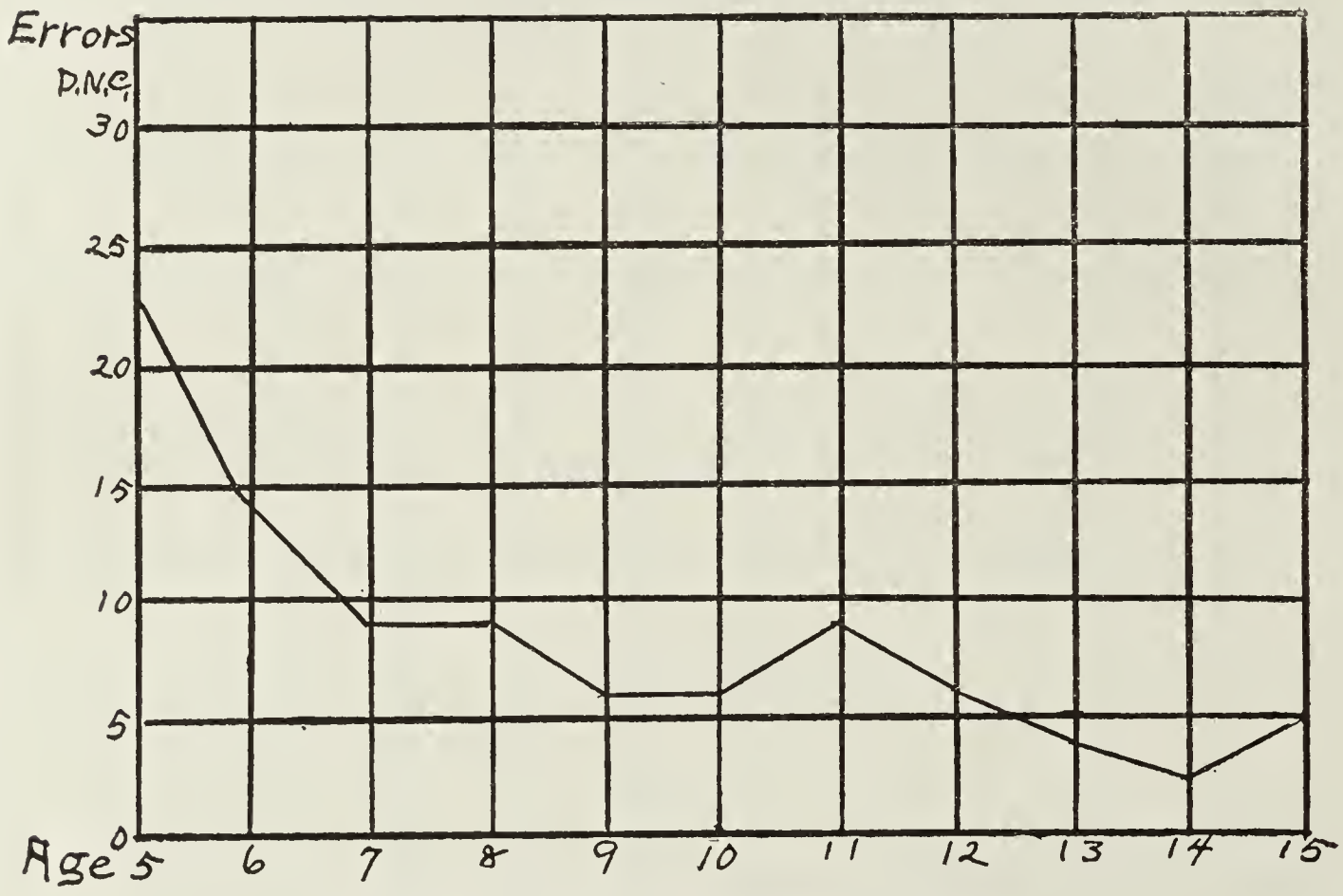


GRAPH 16. The Triangle Test. Errors.

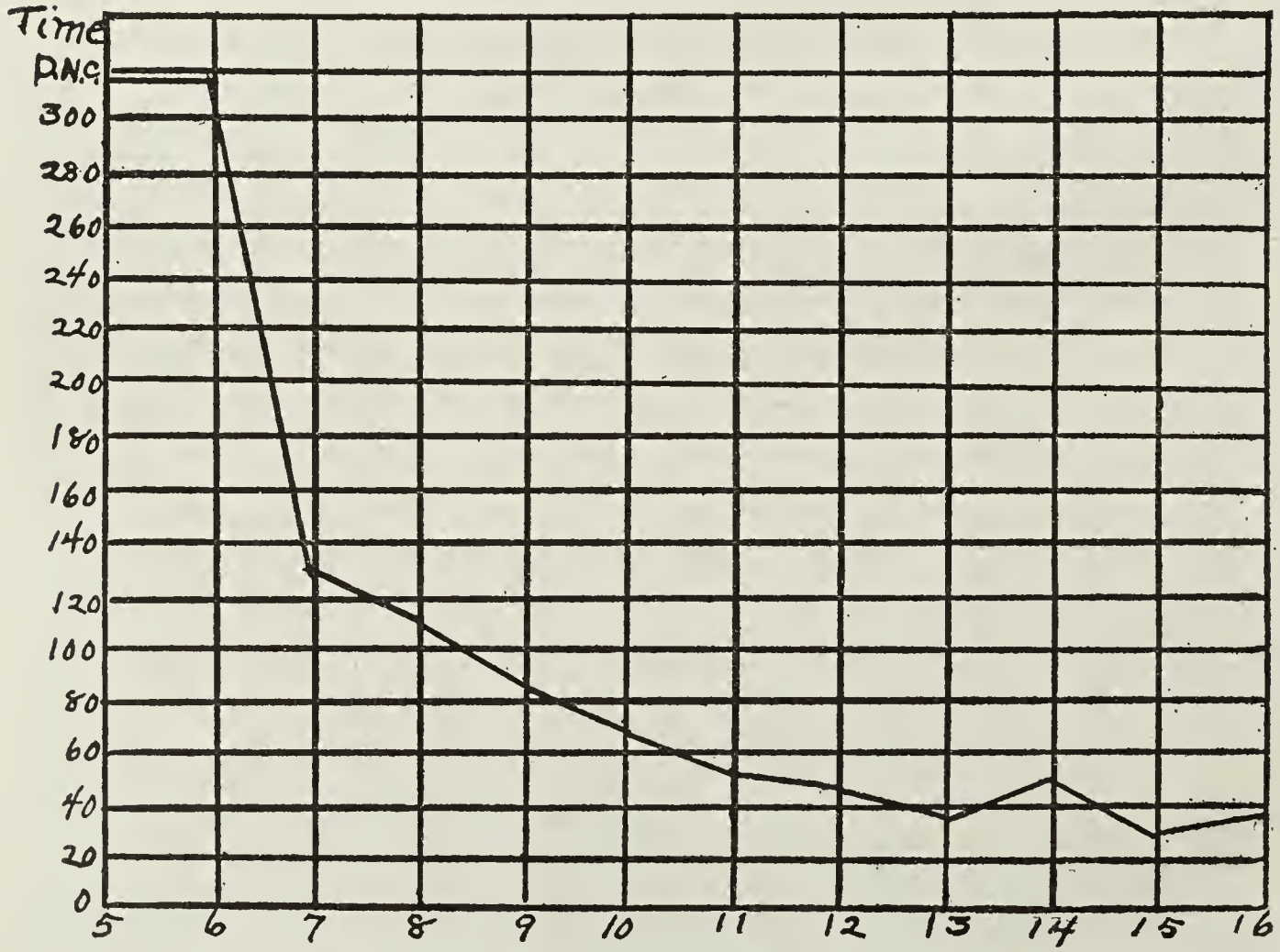


GRAPH 17. The Diagonal Test. Time.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

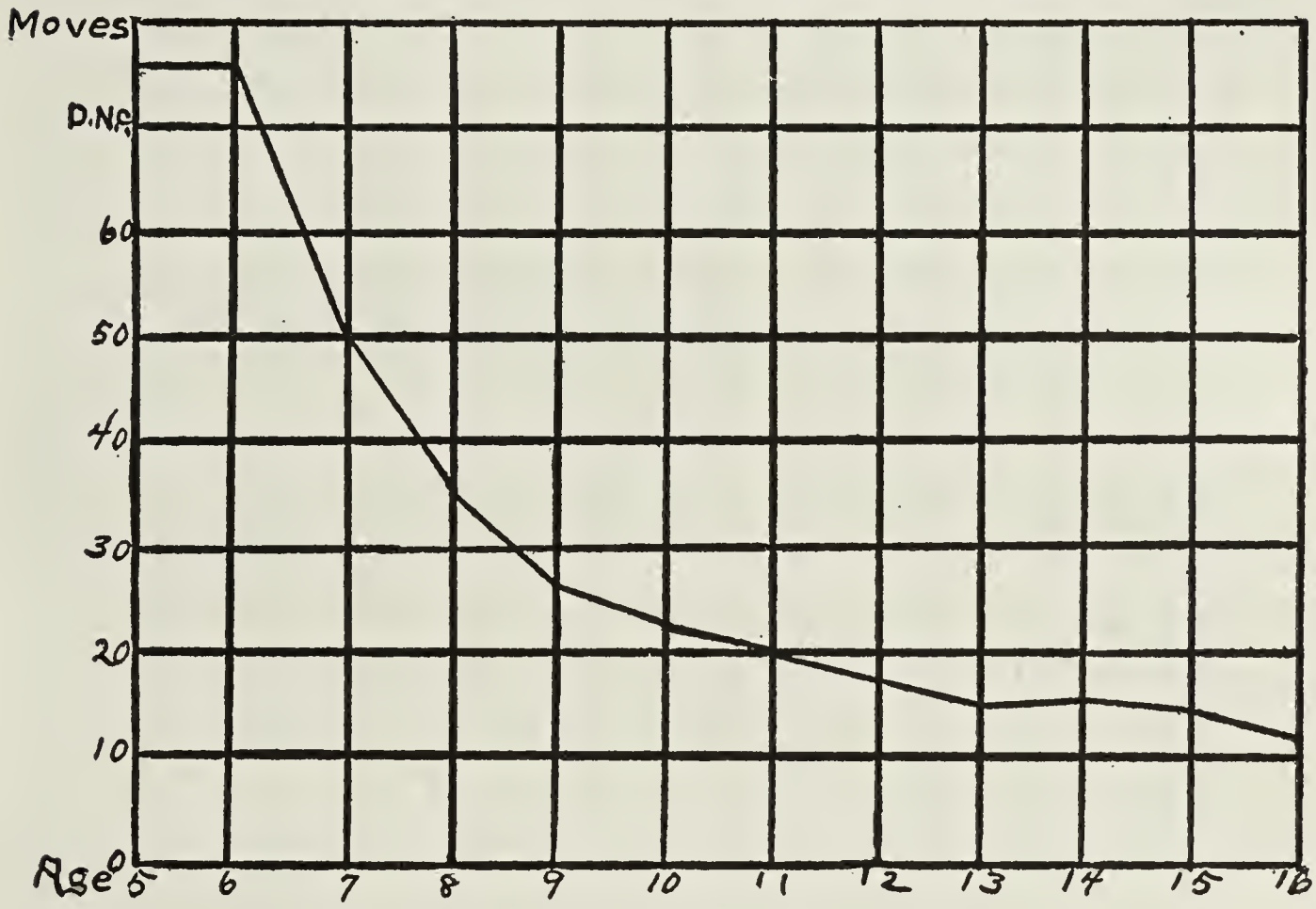


GRAPH 18. The Diagonal Test. Errors.

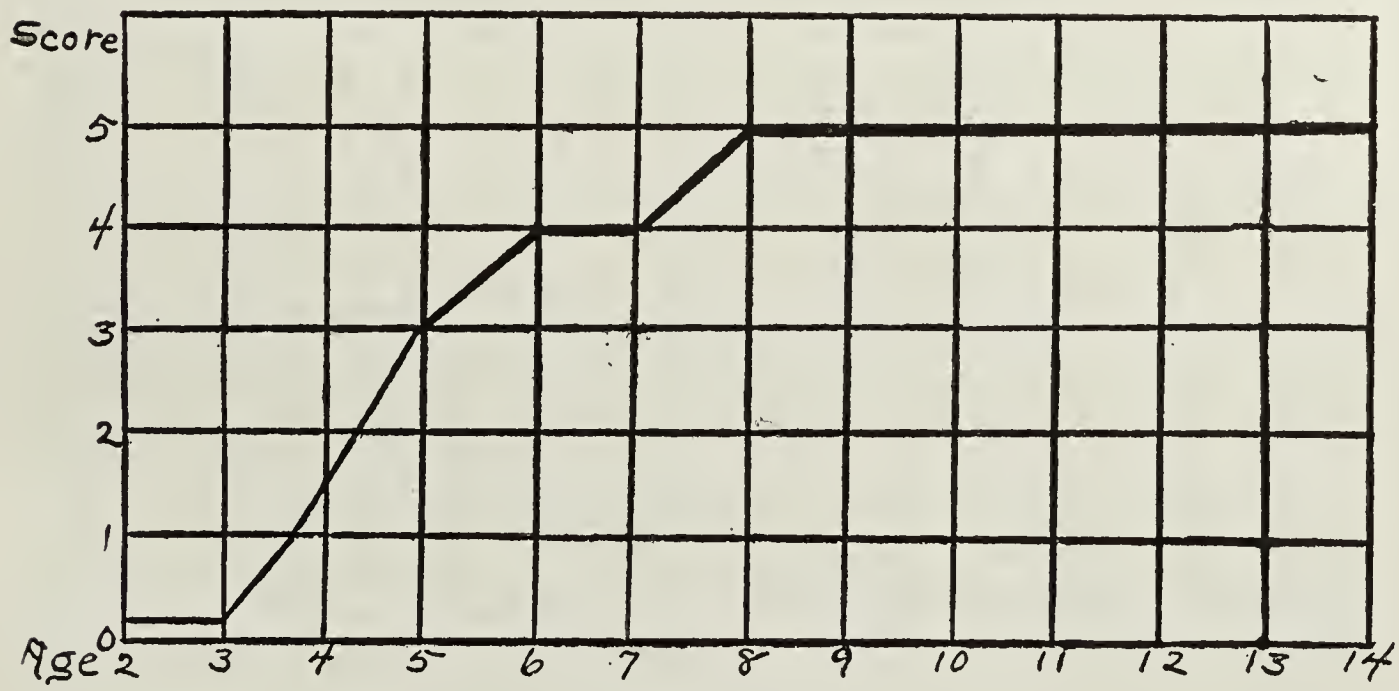


GRAPH 19. Healy Puzzle "A." Time.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

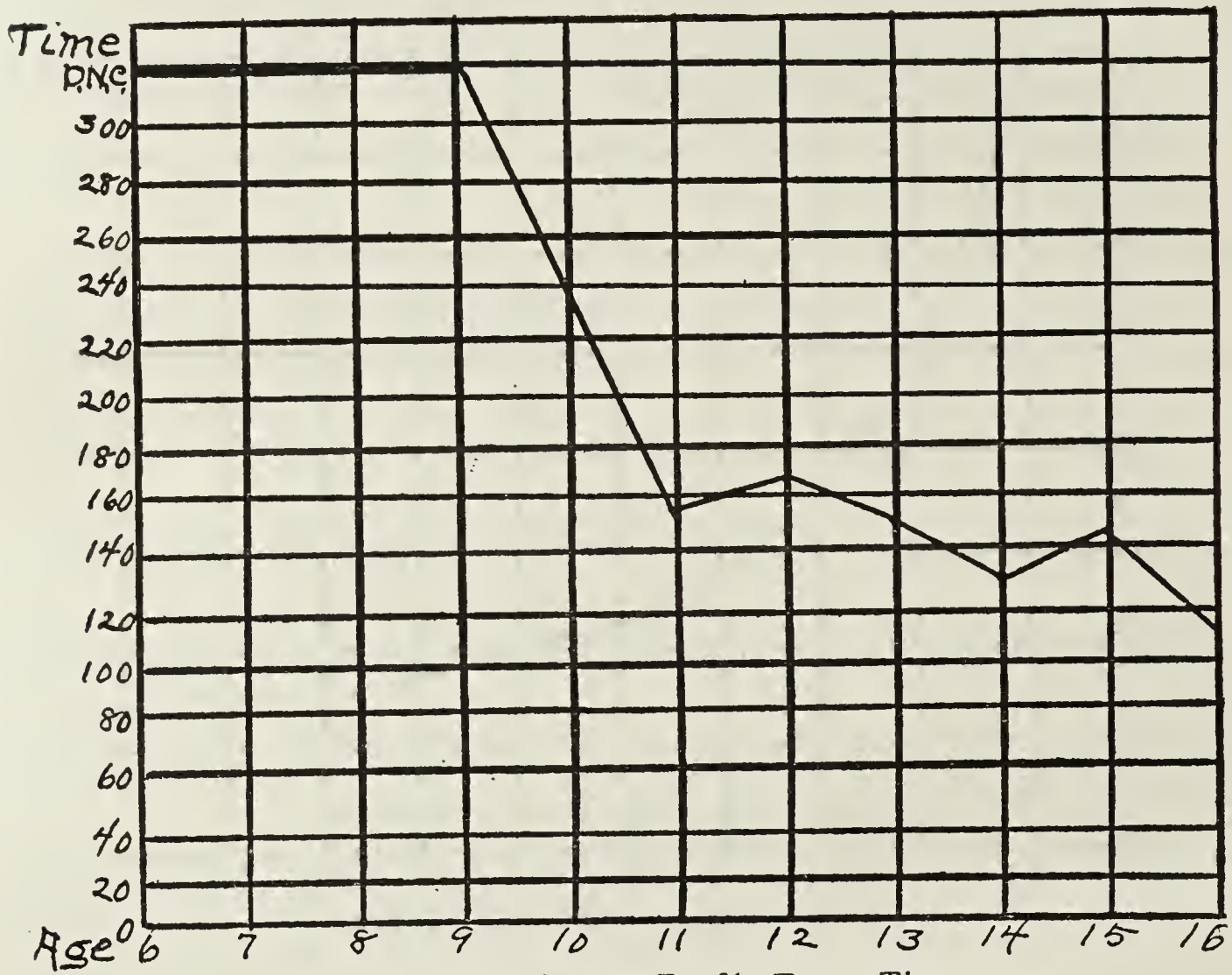


GRAPH 20. Healy Puzzle "A." Moves.

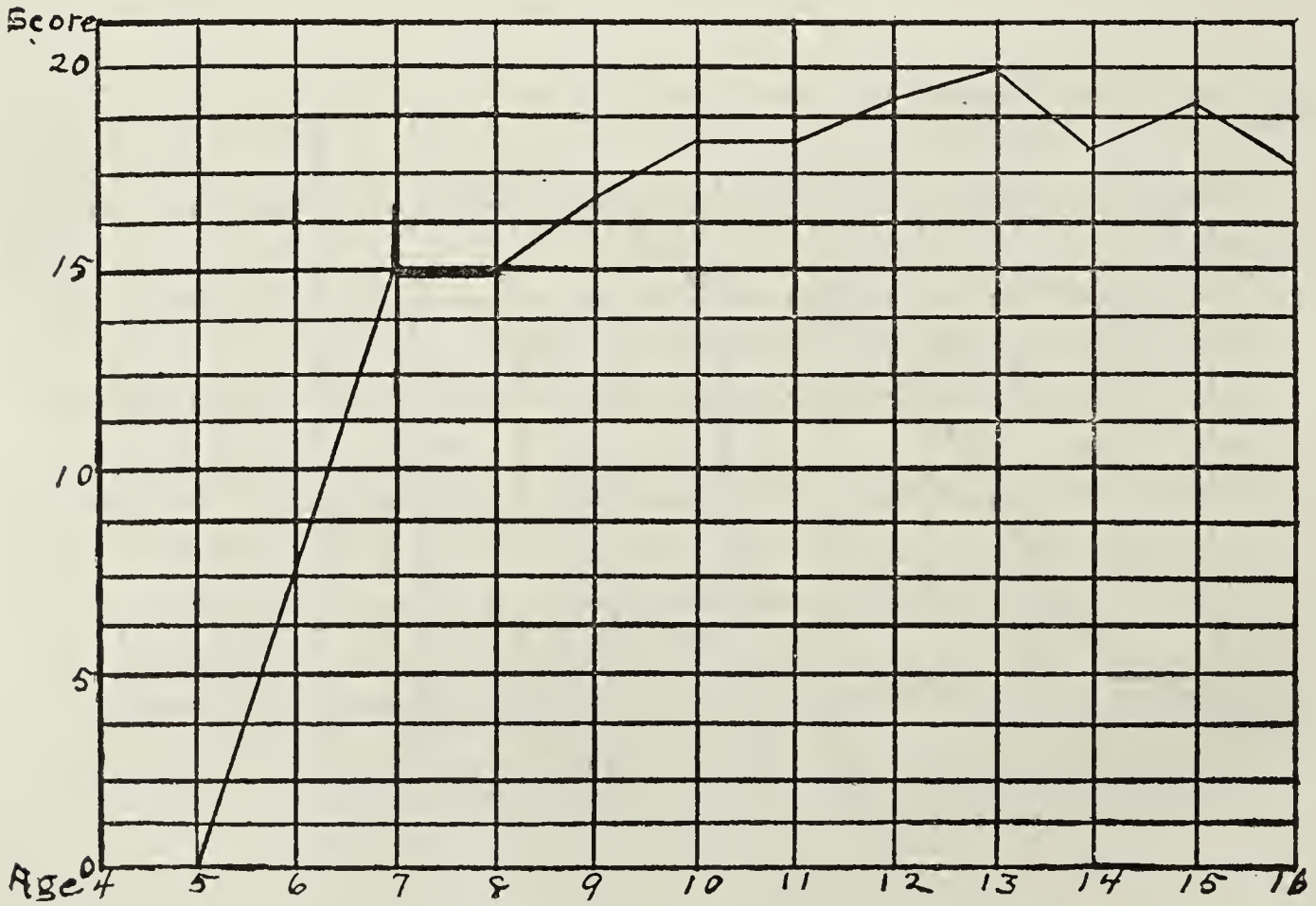


GRAPH 21. The Mannikin Test. Score.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

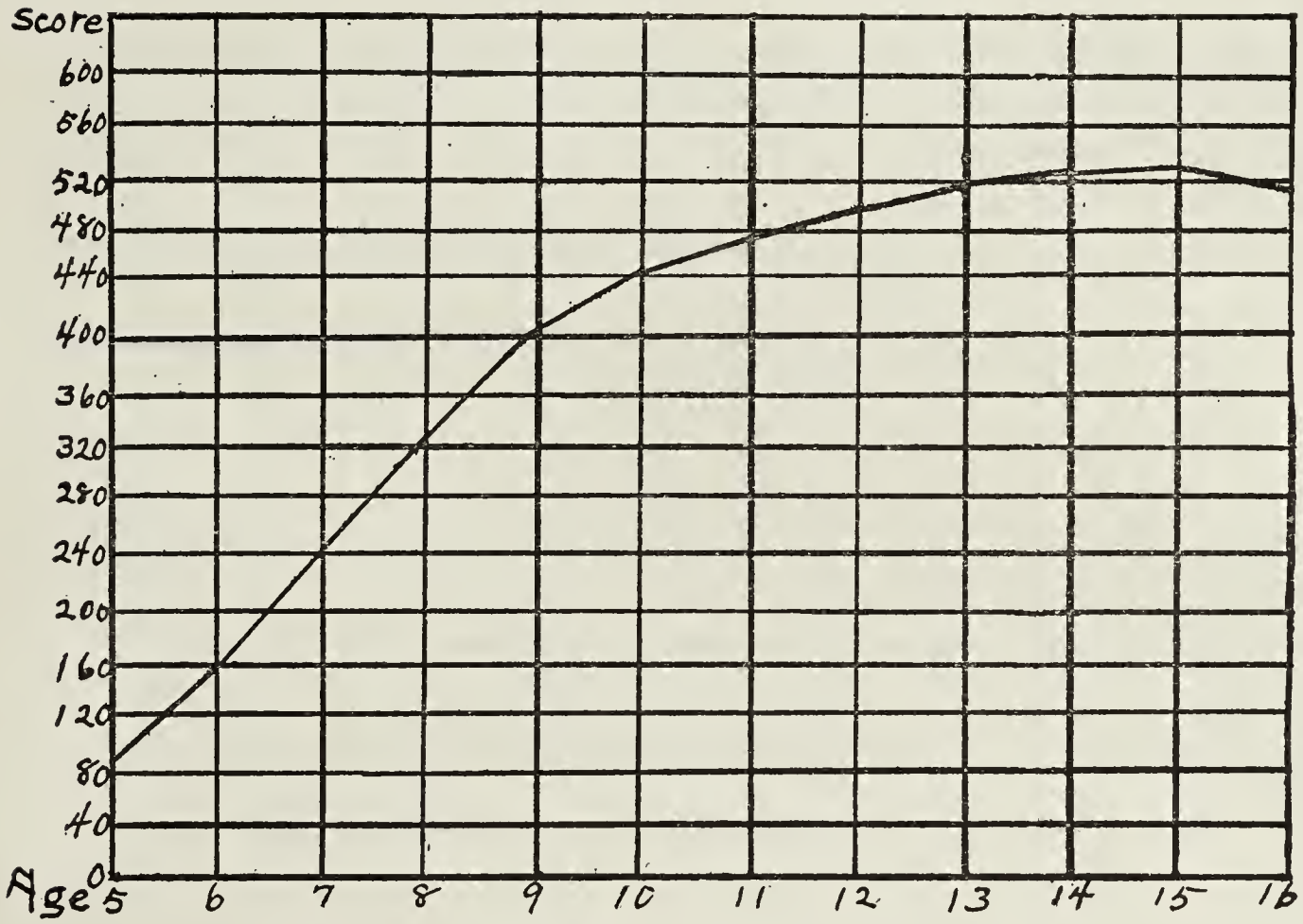


GRAPH 22. The Feature Profile Test. Time.

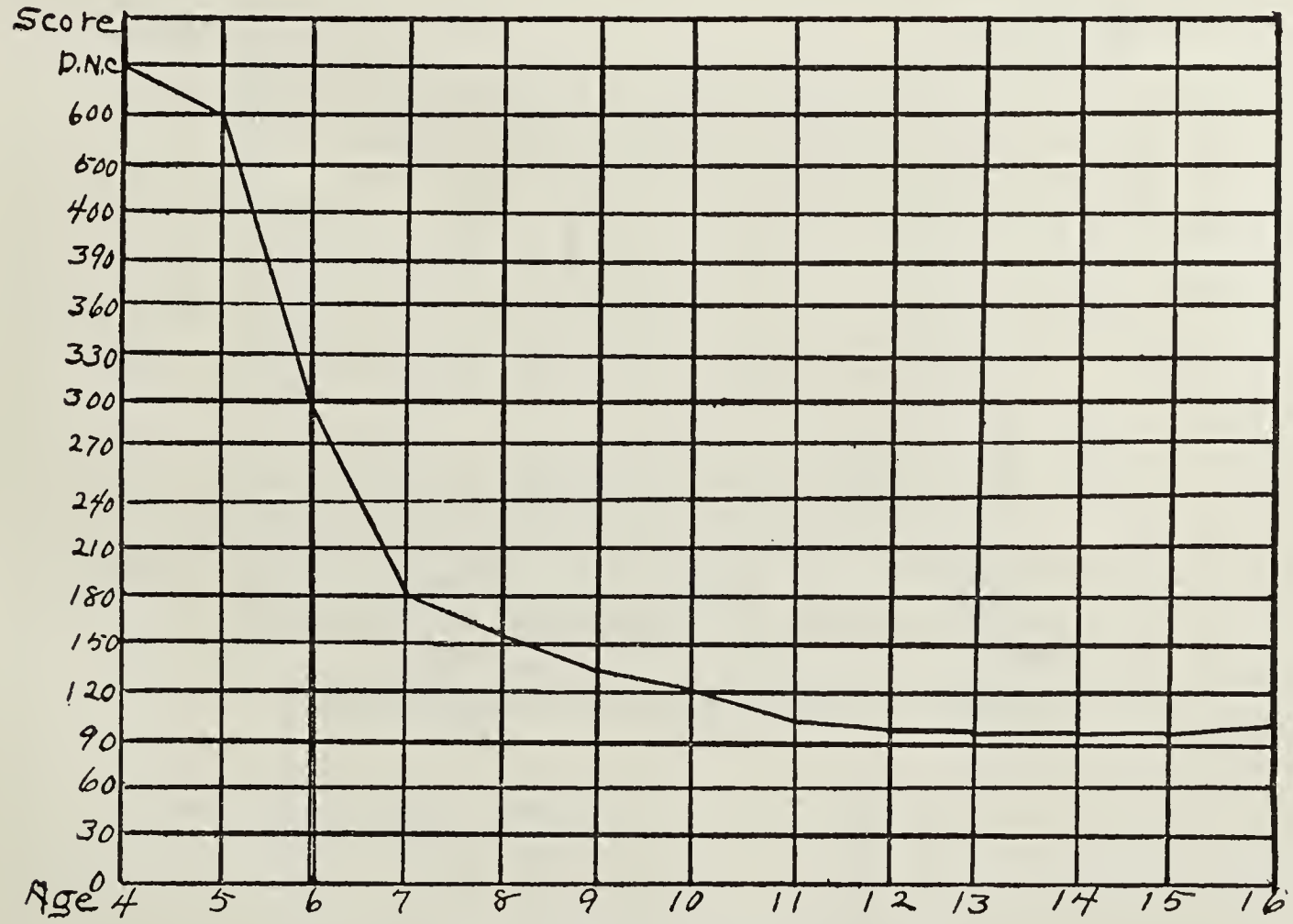


GRAPH 23. The Ship Test. Score.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*

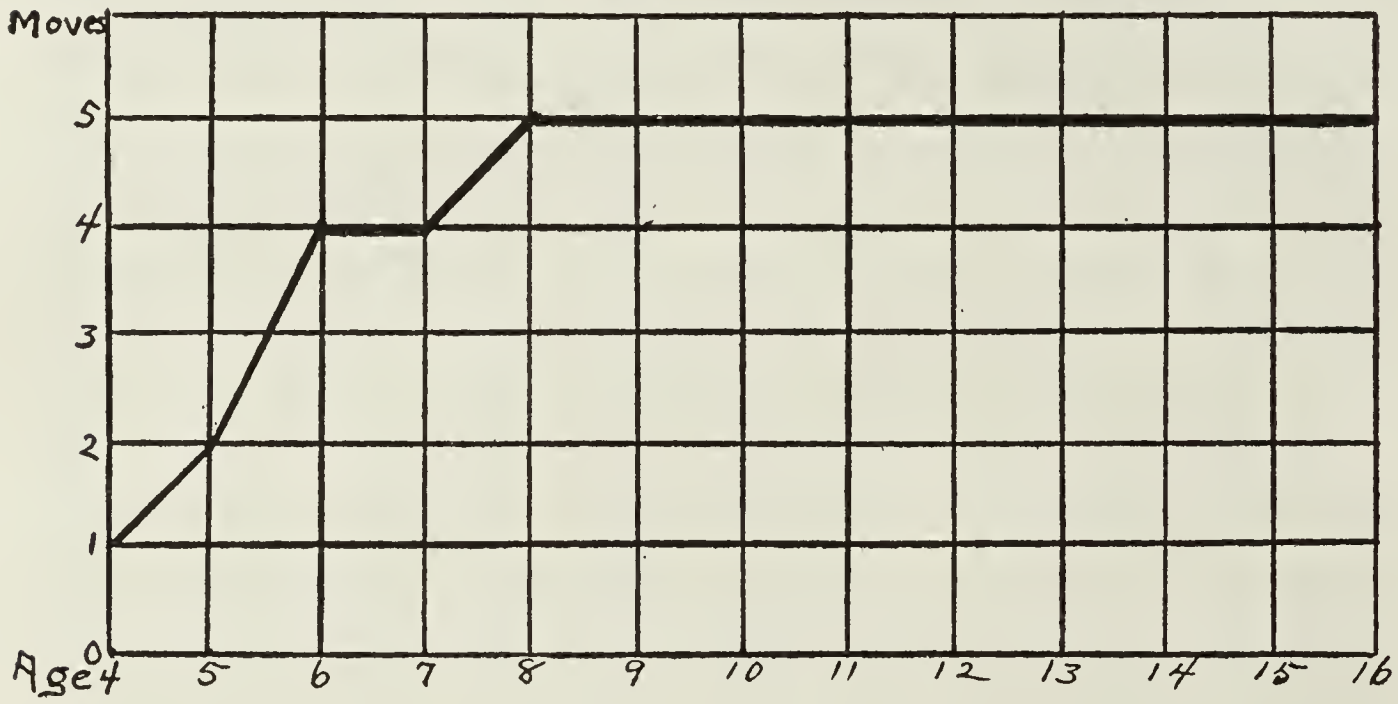


GRAPH 24. The Picture Completion Test. Score.

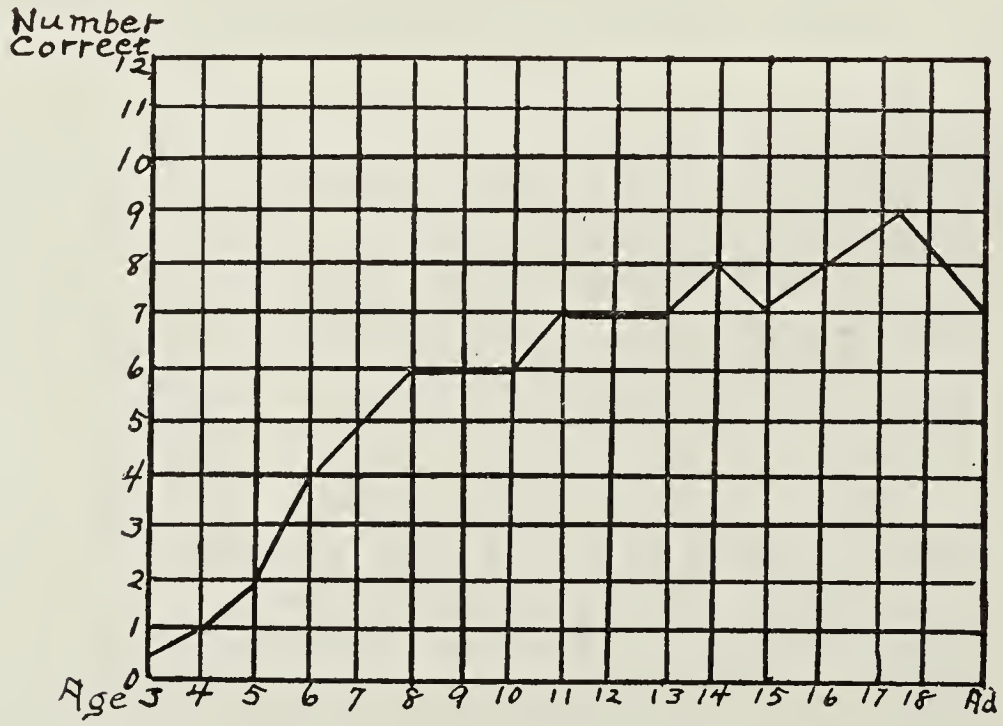


GRAPH 25. The Substitution Test. Score.

GRAPHS FROM "A SCALE OF PERFORMANCE TESTS," PINTNER AND PATTERSON (APPLETON, 1917). *The numbering follows the original text.*



GRAPH 26. The Adaptation Board. Moves correct.



GRAPH 27. The Cube Test. Lines Correct.

D. ILLUSTRATION FROM PERFORMANCE TEST MATERIAL DEVELOPED BY HEALY.

The Healy performance tests show tendencies similar to the other tests of the same type. However, the main use made of Healy's work here will be as a basis for discussion of the relative failure of adults with performance material, and the significance of this fact to the theory of intelligence levels. The following quotation, beginning on page 200 of the monograph, "A Pictorial Completion Test",* is in point:

"The older individual is prone to meet a simple situation with the idea that there must be something back of it. . . . The 'might be' of the adult with his greater stock of ideas is very rarely heard from the child. . . . Of course the chicken 'might be' jumping at the cat, or at the bird in the cage. The greater experience of adults led them to perceive many more possibilities in the situation than the child sees. It may be this, rather than any conscious attempt at criticism which leads the adult to go much farther than taking the picture at its barest face values."

This all means that the normal adult is inclined to inject abstraction into the situation, and to refuse to deal exclusively with the simple concrete which is before him. He puts in much more than he sees. He does poorer work on the tests because his mind really works better. If he cannot put in the extra abstraction, he is not a normal adult, his mind is retarded on the level of the concrete, the predominating level of the child-mind. Below is a table based upon examination of 95 college people with the Healy Picture Completion Test.

THE WELLESLEY DATA†

I.	Cases with no errors	
	Wellesley	26%
	Private School	30%
	Delinquents (B Group)	33%
	Delinquents (A Group)	40%

*Psychological Review, XXI, 3.
†Psychological Review, XXI, 3.

II. Percentage of total errors to pieces placed

Wellesley	21.7%
Private School	15.0%
Delinquents (B Group)	10.0%
Delinquents (A Group)	6.0%

III. Percentage of total errors illogical

Wellesley	64.0%
Private School	50.0%
Delinquents (B Group)	40.0%
Delinquents (A Group)	33.0%

The evidence of poorer work on the part of the college students in the strictly perceptual part of the problem is here very evident. If the suggested reason for it is the true one, however, the poor showing is a recommendation rather than otherwise. Even the high per cent of illogical error as judged in perceptual terms, becomes logical when judged in abstract terms, and therefore becomes a recommendation rather than a fault. These data, therefore, are understandable on the theory that the one who can get the most out of a perceptual test is the one who has not developed beyond the perceptual level. He does not have the great stock of abstract ideas to bother him, and consequently he saves time by direct and naïve solution of the concrete situation. Perhaps the best way to make a performance test indicate truly the intelligence of the adult would be so to regulate it that the number of original, but proved logical, solutions would determine the score. Then the adult would not be penalized for his higher type of intelligence as he now is in such tests. (Pintner and Patterson, working with the Knox tests with children, were obliged to set higher limits of achievement and time than those used by Knox with adults.)—See discussion at several points in "A Scale of Performance Tests", by Pintner and Patterson. (Appleton, 1917.)

E. ILLUSTRATIONS FROM STUDIES DIRECTED TOWARD THE DETERMINATION OF THE TYPE OF MENTAL FUNCTION POSSESSED BY THE FEEBLEMINDED.

A very good illustration is found in the excellent study by Cyrus D. Mead, Ph.D., Teachers' College Contribution to Edu-

cation, No. 76, on "The Relations of General Intelligence to Certain Mental and Physical Traits". The reader is referred to Dr. Mead's monograph for the conclusive data back of the assertions made in the following quotation concerning the relative perceptual and memory powers of the feebleminded and the normal child.

Page 78, line 3: "As a practical suggestion from the above data, and with a firmer conviction after six years of experience in the education of hundreds of mentally defective children, the author would offer the point that in the ability to perceive and to memorize defective children do better than in any other of the purely mental traits. It makes less difference with these children whether the material has relationship than it does with normal children. Memory seems to be a characteristic in itself, native perhaps. It is a common occurrence to have defective children call their teacher's attention to any slight change in the latter's dress. The powers of perception and memory then should be used to the utmost in the education of these children. The most practical contribution made by Miss Norsworthy in her study is quoted: 'To speak of (defectives) them as being equally deficient in all the mental powers is false. . . . From the point of view of the psychologist and the educator it is fully as important to know that the (defective's) perceptive powers are almost two and a half times as strong and accurate as his intellectual powers, and almost half as strong again as is his powers of memory, as to know that he is weaker than the ordinary child in all of these particulars.' "

Three things here are evident: (1) that defective children do not possess the higher mental functions to the degree that these functions are possessed by normal children; (2) that they possess memory and perception to a very considerable degree; and (3) that they tend to fail in the power to note relationships between the memories and percepts which they really possess.

Another illustration may be drawn from the pamphlet by Knox on "Alien Mental Defectives" (Stoelting, Chicago). In this pamphlet is a study entitled, "A Comparative Study of the Imaginative Power in Mental Defectives". Again the reader is referred to the article itself for the data which are too detailed to

reproduce here; but the conclusions are significant. (The test was the common "Ink Blot" test.) Dr. Knox says:

"(1) It is apparent from a study of the tables that there are no Jules Vernes among the twenty-five defectives, at least, and, as compared to the twenty-five normals, there is very little ability to draw mental pictures from commonplace or amorphous objects. (2) The associations among the defectives are for the most part not logical. . . . (4) The reaction-time was nearly twice as long in the defectives as in the normals. . . . (5) Tests of imagination and the average reaction-time to questions may be valuable points to consider when dealing with mental defectives from a diagnostic standpoint."

This quotation, and its supporting data, reinforce the point of the previous quotation that the imaging ability of the feebleminded is less than their perceptive ability, and that their logic, or judgment, is the least of all of their abilities.

F. ILLUSTRATIONS FROM SUCCESS AND FAILURE IN ABSTRACT AND CONCRETE SUBJECTS OF INSTRUCTION.

In an article by Cummins in "The Journal of Educational Psychology", October, 1919, there appears a comparison of "bright" and "slow" pupils. In the process of this study there is developed the following with relation to the relative difficulty of studies:

"By dividing the number of cases in which high marks were received, by the number of cases in which low marks were received, the ratios thus obtained give us a fair picture of the relative difficulty of each subject. Arranging the subjects in the order of these ratios from the highest to the lowest, we have the following array:

Physical Training	14.67
Arts (Domestic and Fine)	5.25
Shop (Manual Training, etc.)	3.00
English and History	1.56
Modern Language	1.42
Science	.92
Ancient Language	.46
Mathematics	.19

Thus there appears an almost perfect gradation all the way from the subject which is almost wholly a matter of ideo-motor coördination, to the subject which involves the largest amount of abstract thinking. The only possible exception is that of ancient language which should no doubt have occurred in the array following the modern languages."

It is true that, since this relationship of studies is based upon marks received, the reason for the greater number of high marks received in physical training, etc., and the frequency of low marks in mathematics, etc., may have been the different marking standards of different teachers. But it is improbable that the sequence in the array from concrete to abstract would have been anywhere nearly so perfect unless it was at least somewhat determinded by the real character of the subjects as well as by the personal equation of the person giving the marks. The conclusion from the data presented that abstract studies are relatively harder (require more intelligence) is a relatively safe one.

Other illustrations of this point might easily be produced. Some material taken from "The Illinois Survey" (Published 1917 by the Illinois State Teachers' Association), will suffice.

TABLE VIII—SEC. 10

Median Proportion of Pupils in Each Grade, Page 124, Reported as "Finding Difficulty in Completing Required Work".

Grade	No. of Teachers Reporting	Median Proportion of Pupils "Finding Difficulty".
I	192	6%-10%
II	124	6%-10%
III	102	11%-15%
IV	116	6%-10%
V	112	6%-10%
VI	114	6%-10%
VII	111	6%-10%
VIII	109	6%-10%

Note.—Because of certain reasons the extra percentage in grade III is not considered especially significant.

In Terman's "The Measurement of Intelligence", p. 78, there is a table showing that in an unselected group of persons of a reasonably large number, the intelligence quotients of the lowest ten per cent will be 85 or below. It is reasonably safe to suppose that the children under consideration by these Illinois teach-

ers represented such an unselected group, and that those reported as "finding difficulty" were largely those of approximately 85 I. Q. or below, since the 6 per cent to 10 per cent reported would be constituted of just about the low I. Q.'s in question. The following table from the same survey gives further light upon the matter.

TABLE IX—SEC. 1, PAGE 125

Subjects in Which Pupils Find it Difficult to Complete the Required Work.

34.60%	of teachers reporting name	reading
18.15%	of teachers reporting name	arithmetic
17.46%	of teachers reporting name	language
17.26%	of teachers reporting name	geography
13.84%	of teachers reporting name	spelling
12.79%	of teachers reporting name	grammar
10.70%	of teachers reporting name	history

On page 143 of the same book is found the following:

"The subjects in which the greatest difficulty is experienced, varies from grade to grade. In general, arithmetic may be looked upon as the most difficult subject as measured by the standard represented in Table IX (teachers' judgments), and the difficulty of this subject is sustained throughout the grades, from the third to the eighth."

It is clear that these teachers found the poorest 10 per cent of the children (almost certainly children of low I. Q.) having trouble with the abstract subjects. Not a single one of the more perceptual subjects is mentioned. Again the result might be due to excessive requirements in the subjects named, and the light requirements in the other subjects; but the chances are all in favor of the assumption that the type of subject, abstract or concrete, is at least partially the determining factor. Another table from the same survey is interesting in this connection.

Something of the same progression from concrete to abstract is seen in Table XVII. The assumption is possibly a fair one that teachers would, in matters of promotion, disregard those subjects which they do not consider to be very good tests of a child's general ability.

In this same survey there is a study of "Some Exceptional High School Pupils in Illinois" by E. E. Jones. He shows that

TABLE XVII—PAGE 140

Subjects Disregarded in Determining Promotion.

Subject	Proportion of 1407 Teachers Reporting Subject as Disregarded
Music	67.3
Drawing	65.4
Writing	31.4
Physiology and Hygiene	10.2
Manual Training	9.1
Physical Training	9.1
Spelling	8.1
Arithmetic	2.8
Reading	2.8
History	2.7
Language	2.0
Geography	1.9
Grammar	9.5

these pupils did all round good work in the grades and did not drift toward any particular line of work. They were not pushed early into manual training or other hand work. They had general ability; and this general ability showed in the high school as well as in the grades. The pupils tended to be good in everything that they undertook. And yet the author says that he found no reason why these persons excelled. Is it not clear that they excelled because they had good general endowment—in ability to deal with the abstract as well as in ability to deal with the concrete?

CHAPTER V

The Fundamental Nature of Intentional Adaptation (Continued).

I. Original quantitative studies.

1. In upper school grades.

Attempts made by the writer to test the hypothesis of levels in intentionally controlled intelligence have been guided by the conclusion that if the theory in question is true, then the achievement of high and low intelligence should be nearest together on the perceptual level where all tend to be more equally endowed, and farthest apart on the symbol level, upon which low intelligence finds it hard to act at all. (To leave out the image level accents the contrast of the extremes.)

In this upper grade study the first step in quantitative determination was that of ascertaining the general intelligence of a chosen group so that the result could be used as a criterion for checking further work. For this purpose the Binet-Simon tests were chosen as the best available instrument. It is true that these tests themselves show a gradation from perceptual material to symbol material, and that, at first glance, it might seem that to use them as a criterion in attempts to prove the existence of levels based upon the same principle, would be to reason in a circle. On the contrary, the exact reverse is the case. When the authors devised these tests they made use of a purely trial and error method. They experimented with very numerous "stunts" of all descriptions and the separate tests really located themselves. They fell into certain relative positions and relationships because as a result of their fundamental nature they could occupy no other positions and relationships. After they had assumed those relationships, and so had become a scale for the measurement of intelligence, that scale was checked by criteria

of all kinds, such as estimates of intelligence, school work, school progress, experience in life, etc., etc.; and it is now generally admitted to be the best instrument for getting at an approximation to exact quantitative measurement of intelligence. If one accepts the scale as it is and examines it with the purpose of discovering the factor responsible for the self-arrangement of the individual tests, one is forced to conclude that this responsible factor lies in differences in amounts of perceptual and symbolic material utilized at various levels. Thus these tests themselves supply a certain amount of confirmation of the hypothesis for which proof is sought, and they have already been so cited.

But one can go farther. For example, if one makes brick and gets an especially excellent quality, he may examine all conditions of the process and try to decide upon the factor responsible for the excellence. Then he can vary that factor, compare with the original results, and so test his opinion as to the factor's responsibility for the excellence. The intention has been similar in the present instance. The start is made on the theory of the responsibility of the proportions of the perceptual and symbol materials, those proportions are varied, and the results are examined for light upon the theory.

An abbreviated form of the Binet-Simon tests (the starred tests of the Stanford Revision) was given to 364 children in grades four to eight, inclusive, of a normal training school. Table I shows the raw data of this study.

TABLE I

Original Data: Abbreviated Binet and Teachers' Estimates of Intelligence. Eighth Grade.

Case	Born	Tested	M.A.	1st Est.	2nd Est.
1	10/18/03	3/ 4/19	14- 2.5	5	4
2	12/24/04	2/25/19	14- 7.5	4	4
3	11/16/04	2/25/19	15- 4.5	4	4
4	12/29/05	2/28/19	16- 0	4	4
5	1/26/05	2/26/19	17- 4.5	3	3
6	9/14/03	2/25/19	15-10.5	3	3
7	10/17/02	3/ 4/19	13- 0	6	5
8	12/ 4/03	3/ 4/19	13- 9.5	6	5
9	5/ 6/05	2/26/19	15- 2	4	3
10	8/23/04	2/25/19	16- 7.5	4	3
11	6/13/03	2/27/19	14- 8	4	5
12	9/ 9/03	2/26/19	15- 9.5	5	4
13	11/25/03	3/ 4/19	12- 7.5	6	5

TABLE I (Continued)
Eighth Grade

Case	Born	Tested	M.A.	1st Est.	2nd Est.
14	1/11/05	2/26/19	15-10.5	1	3
15	6/28/01	3/ 4/19	11- 4	6	6
16	3/ 1/04	2/28/19	13- 9.5	4	4
17	5/19/05	2/27/19	13- 7.5	3	4
18	3/ 6/04	2/28/19	15- 4.5	3	4
19	9/17/03	2/27/19	13- 7.5	4	4
20	4/ 9/03	2/25/19	12- 8	5	5
21	8/ 2/02	3/ 4/19	13- 7	6	5
22	7/17/05	2/28/19	15- 5.5	4	4
23	3/30/05	2/26/19	14- 5	4	4
24	11/16/04	3/ 4/19	13- 2	4	5
25	10/28/01	3/ 4/19	11- 4.5	5	6
26	8/21/03	2/28/19	12- 6	5	5
27	3/ 9/03	3/ 4/19	12- 8	6	5
28	3/18/05	2/25/19	13- 1.5	3	4
29	9/18/05	2/26/19	16- 0	1	1
30	10/ 1/03	2/27/19	13-11.5	4	4
31	5/14/05	2/26/19	14- 5	4	4
32	5/18/03	3/ 4/19	12- 7.5	6	6
33	7/20/04	2/28/19	13- 9	4	4
34	11/24/04	3/ 4/19	16- 7.5	3	3
35	12/ 4/02	2/26/19	13- 1.5	4	4
36	4/ 2/02	3/ 4/19	13- 3.5	7	7
37	8/29/04	3/ 4/19	14- 2	4	4
38	2/18/06	2/25/19	15- 6	1	1
39	2/12/01	3/ 4/19	15- 3	5	6
40	10/ 2/04	3/ 4/19	14- 3	5	5
41	11/ 8/05	3/ 4/19	15- 3	4	4
42	1/29/06	3/ 4/19	14- 4.5	4	4
43	11/ 2/00	4/ 9/19	13- 3.5	6	6
44	2/ 5/06	3/ 4/19	16-10.5	4	3
45	11/ 2/04	3/ 4/19	14- 9	3	3
46	6/16/06	3/ 4/19	18- 1.5	2	1
47	1/19/05	3/ 4/19	16- 7.5	3	4
48	6/ 8/04	3/ 4/19	15- 9.5	4	4
49	2/ 8/06	3/ 4/19	15- 4.5	4	4
50	8/ 2/04	3/ 4/19	14- 3	4	3
51	12/25/02	3/ 3/19	15- 8	6	6
52	12/15/04	3/ 4/19	13- 2	5	4
53	7/11/05	3/ 3/19	14- 7.5	4	4
54	3/22/05	3/ 4/19	14- 1.5	6	6
55	8/14/03	3/ 4/19	16-10.5	4	4
56	5/29/04	3/ 4/19	13- 8.5	6	6
57	2/15/07	3/ 4/19	16- 1.5	2	2
58	10/13/05	3/ 4/19	17- 4.5	2	2
59	10/ 6/05	3/ 4/19	13-11	5	5
60	8/ 4/03	3/ 4/19	15- 1.5	5	5
61	12/12/02	3/ 4/19	14- 6	6	6
62	12/ 9/03	3/ 4/19	13- 9.5	5	5
63	11/23/02	3/ 4/19	12- 8.5	6	6
64	3/ 2/05	3/ 4/19	12- 6	4	4
65	5/20/05	3/ 4/19	14- 7.5	4	4
66	12/23/05	3/ 4/19	12- 8.5	4	4
67	2/22/04	3/ 4/19	15- 6	4	4
68	6/24/07	3/ 4/19	15- 4.5	4	4

TABLE I (Continued)

Case	Born	Tested	M.A.	1st Est.	2nd Est.
		Eighth Grade			
69	11/ 6/04	3/ 3/19	14- 4.5	4	4
70	5/22/04	3/ 4/19	16- 0	5	5
71	10/ 4/04	3/ 4/19	11- 8	5	5
72	2/18/04	3/ 4/19	13- 6	5	5
73	9/15/05	3/ 4/19	14- 5	4	4
74	3/11/06	3/ 4/19	16- 0	4	4
		Seventh Grade			
1	6/ 9/05	3/ 4/19	16- 0	4	4
2	9/20/05	3/ 4/19	14-10.5	4	4
3	3/ 7/06	3/ 4/19	15- 9	3	2
4	1/ 1/04	3/ 4/19	14- 0.5	4	4
5	5/13/05	3/ 4/19	16- 0	3	3
6	10/12/02	3/ 4/19	14-10	4	3
7	11/ 9/05	3/ 4/19	14- 7.5	3	3
8	11/23/03	4/11/19	13- 2	5	5
9	6/ 4/05	3/ 4/19	15- 6.5	3	3
10	7/23/07	4/11/19	16- 1.5	3	3
11	1/20/05	3/11/19	15- 7.5	4	5
12	12/ 7/05	3/ 4/19	16- 0	4	3
13	9/24/06	3/ 4/19	15- 4.5	3	2
14	12/ 8/03	3/11/19	14- 3	5	5
15	12/15/04	3/ 4/19	14-10.5	4	5
16	3/ 7/05	3/ 4/19	14- 7.5	4	4
17	12/ 8/05	3/ 4/19	18- 9	2	2
18	2/29/04	3/ 4/19	9- 4	7	7
19	11/ 9/04	3/ 4/19	13- 3.5	4	4
20	7/13/04	3/ 4/19	16- 0	5	5
21	8/13/04	3/11/19	12-11.5	4	4
22	12/16/05	3/ 4/19	14- 6.5	4	4
23	6/17/05	3/ 4/19	13- 6.5	4	4
24	9/29/05	3/ 4/19	16- 1.5	3	3
25	1/22/07	3/ 4/19	14- 4.5	3	3
26	8/20/04	3/11/19	15- 7.5	4	5
27	12/20/05	3/11/19	12- 2	3	4
28	5/31/04	3/11/19	14- 1.5	5	5
29	11/16/03	3/11/19	14- 0	4	4
30	12/ 3/05	3/11/19	15- 3	3	4
31	1/12/06	3/ 4/19	13- 1.5	4	4
32	10/22/05	3/ 4/19	12- 5.5	4	5
33	11/26/05	3/ 3/19	16-10.5	3	4
34	10/23/03	3/11/19	12- 9	4	4
35	11/13/05	3/ 4/19	14- 3	4	4
36	3/23/06	3/ 4/19	15- 2	4	4
37	4/15/04	3/11/19	13- 0	4	4
38	3/12/05	3/11/19	12- 2	5	6
39	6/22/05	3/11/19	15- 0	4	6
40	9/ 2/06	4/18/19	12- 0	4	4
41	3/14/04	3/11/19	15- 0	4	4
42	7/15/05	3/11/19	16- 0	4	4
43	7/15/05	3/11/19	12- 8	4	4
44	12/20/04	3/11/19	12-10	4	4
45	12/ 3/06	3/ 4/19	15-10.5	2	2
46	10/ 4/05	3/11/19	12-11.5	4	4
47	6/18/05	3/11/19	10-10	4	4

TABLE I (Continued)

Case	Born	Tested	M.A.	1st Est.	2nd Est.
		Seventh Grade			
48	6/11/07	3/11/19	17- 4.5	2	2
49	1/ 5/06	3/ 4/19	12- 0	4	4
50	12/17/06	3/ 4/19	13-11	2	2
51	10/20/03	3/11/19	11- 4	6	5
52	3/22/06	3/ 4/19	14- 9	2	2
53	7/20/05	3/11/19	13- 6.5	4	4
54	2/13/05	3/11/19	11- 8	5	5
55	4/20/05	3/ 4/19	11- 8	5	5
56	2/16/07	3/11/19	14- 9	3	3
57	12/ 8/05	3/11/19	12- 4	4	4
58	1/11/06	3/11/19	14-10	4	4
59	7/ 4/06	3/ 4/19	13- 3.5	3	2
60	6/ 7/06	3/11/19	15- 4.5	4	4
61	11/25/05	3/11/19	15- 0	4	4
62	6/13/06	3/11/19	11-10	4	4
63	2/ 6/05	3/11/19	12- 4	4	4
64	10/19/05	3/11/19	12- 4	4	4
65	7/29/06	3/11/19	16- 3	4	4
66	4/ 3/06	3/ 4/19	14- 3.5	4	4
67	12/19/07	3/ 4/19	13- 7.5	2	2
68	1/13/07	3/ 4/19	16- 3	2	3
		Sixth Grade			
1	8/ 6/06	3/11/19	12- 4	4	6
2	7/19/04	3/11/19	11-10	6	6
3	4/28/04	3/11/19	14- 7.5	5	4
4	6/12/06	3/27/19	13- 7.5	4	3
5	8/ 7/06	3/11/19	13- 9.5	5	4
6	7 /7/06	3/11/19	12-11.5	4	4
7	8/17/04	3/11/19	12- 4	4	4
8	1/26/05	4/11/19	12- 0	3	3
9	2/15/06	3/11/19	12- 4	5	3
10	8/ 7/07	4/11/19	16- 3	2	2
11	4/ 2/03	3/28/19	13- 4	6	5
12	12/23/02	3/11/19	12- 0	6	7
13	9/10/06	3/11/19	12- 8	4	5
14	1/ 5/06	3/11/19	12- 5	4	5
15	2/ 7/06	3/11/19	11- 7	4	4
16	4/ 4/06	3/11/19	13- 9.5	4	4
17	1/ 4/06	3/18/19	13- 0	5	5
18	2/ 1/07	3/11/19	11- 0	5	5
19	12/29/07	3/11/19	14- 1.5	2	2
20	3/ 1/06	3/18/19	13- 9	4	5
21	12/15/07	3/11/19	11- 6	4	5
22	1/ 5/06	3/11/19	15- 7.5	2	2
23	9/ 8/06	3/11/19	13- 4	5	4
24	4/27/08	3/11/19	15- 8	2	2
25	4/24/07	3/11/19	16- 1.5	2	2
26	11/25/04	4/14/19	11- 4	7	5
27	9/13/05	3/11/19	9- 9	6	5
28	1/ 9/05	3/27/19	13-11	3	3
29	5/26/06	3/27 :19	12-11	5	4
30	2/28/07	3/11/19	12- 8	6	6
31	2/20/27	3/11/19	14- 6	1	1
32	3/ 6/06	3/25/19	12- 8.5	5	5

TABLE I (Continued)

Sixth Grade

Case	Born	Tested	M.A.	1st Est.	2nd Est.
33	6/ 3/06	3/12/19	13- 5.5	3	3
34	8/ 8/04	3/18/19	12-11	4	4
35	1/16/07	3/11/19	15- 0	3	2
36	8/25/07	3/11/19	15- 4.5	1	1
37	11/ 4/04	3/24/19	14- 3	2	2
38	5/16/06	3/18/19	13-11	5	5
39	9/27/06	3/18/19	11- 5	5	5
40	6/20/05	3/21/19	12- 1	5	5
41	9/27/05	3/17/19	14-10	2	3
42	3/17/06	3/17/19	15-10.5	2	3
43	2/ 7/07	3/11/19	12- 7.5	2	3
44	1/10/05	3/11/19	12- 6	6	7
45	3/ 6/06	3/24/19	15- 6	4	2
46	1/27/07	3/11/19	13- 7.5	4	3
47	7/ 6/06	3/18/19	14-10	4	3
48	3/ 3/07	3/11/19	10- 9	4	4
49	9/16/06	3/11/19	11- 2	5	4
50	7/15/05	3/18/19	11-10	4	5
51	5/18/07	3/11/19	14- 3.5	2	2
52	11/25/06	3/24/19	12-11.5	4	3
53	3/ 1/08	3/11/19	15- 7.5	2	1
54	5/12/06	3/31/10	15- 4.5	2	2
55	5/23/07	3/11/19	13- 9.5	3	3
56	2/ 9/08	3/27/19	10- 0	2	2
57	1/ 3/06	3/18/19	16- 7.5	2	2
58	9/30/07	3/20/19	13- 8	3	3
59	12/29/06	3/26/19	11- 9.5	6	6
60	5/31/06	3/27/19	12- 8	5	5
61	10/ 1/06	3/27/19	11- 4	5	4
62	7/10/07	3/24/19	11-10	5	5
63	7/25/07	3/18/19	14- 1.5	3	2
64	9/25/06	3/20/19	12- 5.5	2	4
65	6/ 5/07	3/24/19	15- 6	5	4
66	11/29/07	3/24/19	11- 4	4	4
67	11/19/06	3/21/19	11- 4	7	6
68	10/23/05	3/27/19	9- 6	6	4
69	6/ 4/07	3/24/19	12-11.5	4	4
70	2/ 7/05	3/24/19	11-10	6	4
71	11/10/05	3/24/19	14- 6.5	3	3
72	3/ 8/07	3/24/19	12- 4	2	3
73	10/27/04	3/24/19	10- 8	6	5
		Fifth Grade			
1	2/16/08	3/18/19	11- 8	3	3
2	10/ 4/06	3/20/19	12- 1.5	4	3
3	6/15/06	3/27/19	10- 9	5	5
4	3/ 4/06	5/13/19	10- 4	5	4
5	7/25/06	5/ 2/19	10- 2	5	5
6	9/17/06	3/27/19	11- 8	3	3
7	9/29/08	3/21/19	16- 3	2	2
8	5/11/08	3/18/19	11- 4	2	2
9	10/14/06	3/27/19	15- 9.5	4	4
10	5/ 5/06	3/18/19	15- 1.5	3	3
11	2/ 6/06	3/27/19	12- 3.5	4	5
12	7/ 2/04	5/ 5/19	10- 6	6	6
13	12/ 1/06	3/26/19	11- 3.5	4	4

TABLE I (Continued)
Fifth Grade

Case	Born	Tested	M.A.	1st Est.	2nd Est.
14	1/14/07	3/27/19	10- 8	4	4
15	10/27/04	4/29/19	11- 8	5	5
16	1/20/08	3/25/19	11- 0	4	4
17	10/ 3/06	3/27/19	10- 6	4	4
18	10/30/07	3/25/19	13- 6.5	2	2
19	4/15/07	3/25/19	13- 9	3	3
20	6/ 5/07	3/18/19	12-11.5	2	3
21	8/26/04	3/18/19	12- 7.5	5	6
22	2/20/09	3/25/19	15- 4.5	1	1
23	3/13/07	3/26/19	11- 8	2	3
24	3/13/08	3/18/19	11- 4	3	3
25	9/17/07	3/25/19	11- 0	4	3
26	7/11/07	4/30/19	11- 6	4	4
27	10/12/05	5/ 2/19	11- 6	4	4
28	1/24/09	4/30/19	13- 9.5	2	2
29	12/ 2/07	4/30/19	10- 9	3	4
30	10/28/07	5/ 2/19	12-11.5	3	3
31	8/22/05	5/ 2/19	12- 0	5	4
32	7/28/08	5/ 2/19	12- 2	3	3
33	6/19/08	5/14/19	11- 0	4	3
34	5/27/06	5/ 1/19	12- 3.5	4	3
35	6/13/07	4/29/19	12- 4	3	3
36	2/ 8/07	5/ 2/19	11- 1	4	4
37	3/ 1/08	5/ 3/19	12- 1.5	4	3
38	8/23/07	4/30/19	10- 8	5	4
39	7/ 7/07	4/30/19	12- 9.5	4	4
40	7/21/08	4/30/19	11- 5	3	3
41	4/28/08	5/ 2/19	13- 9	3	3
42	1/10/06	5/ 2/19	13- 4	4	4
43	5/15/04	5/ 5/19	9- 3	6	6
44	10/18/08	5/12/19	12- 3.5	4	4
45	9/18/07	5/ 2/19	12- 1.5	4	3
46	4/17/09	5/ 5/19	14- 5	2	3
47	7/ 2/08	5/ 2/19	12- 0	5	5
48	5/19/07	5/ 3/19	13- 5	4	4
49	2/ 1/09	5/ 2/19	12- 7.5	4	3
50	7/18/08	5/ 7/19	11- 8	4	3
51	3/23/06	5/ 6/19	10- 0	4	4
52	7/16/06	4/29/19	11- 4	5	5
53	2/22/07	5/ 7/19	11- 4.5	5	5
54	6/ 8/08	5/ 5/19	14-10.5	4	3
55	6/ 1/07	4/28/19	9-10	5	5
56	4/15/08	4/23/19	11-11.5	4	4
57	1/12/06	5/ 8/19	11- 3.5	5	5
58	4/ 3/09	5/ 5/19	10- 8	4	4
59	10/ 8/06	5/ 6/19	10- 8	5	5
60	10/17/07	5/ 6/19	11- 8	5	5
61	3/ 4/08	5/ 5/19	9-10	4	5
62	8/12/08	5/ 6/19	10- 0	4	5
63	3/29/09	4/23/19	9- 7	4	4
64	4/13/08	5/ 6/19	10-10	5	5
65	10/18/08	4/21/19	9- 6	6	6
66	7/10/08	5/ 2/19	11- 8	4	4
67	5/26/08	5/ 1/19	10- 5	4	3
68	2/20/08	4/28/19	10- 5	4	4
69	6/23/06	5/ 8/19	9- 8	5	5

TABLE I (Continued)

Case	Born	Tested	M.A.	1st Est.	2nd Est.
		Fifth Grade			
70	1/ 9/08	5/ 5/19	10- 8	5	5
71	9/30/08	5/ 2/19	17- 1.5	3	2
72	6/20/08	5/ 2/19	11- 0	3	3
73	11/19/08	5/ 7/19	11- 3.5	4	4
74	10/ 2/07	4/30/19	9- 7	5	5
75	2/22/08	5/ 3/19	11- 2	4	4
76	12/30/07	5/ 2/19	11- 8	4	4
77	1/29/07	5/ 1/19	11- 6	4	4
78	3/ 7/08	4/23/19	10- 6	5	5
79	4/30/07	5/ 5/19	10- 8	3	3
80	3/ 6/09	5/ 5/19	11- 4	4	3
81	10/23/07	5/ 5/19	10- 8	4	3
		Fourth Grade			
1	10/ 5/08	4/23/19	11- 5	5	5
2	10/27/08	4/29/19	9- 3	5	5
3	3/29/09	4/24/19	12- 6.5	2	2
4	4/ 9/08	4/28/19	11- 8	3	3
5	9/28/08	4/23:19	13- 3.5	2	2
6	8/23/08	4/21/19	11- 0	4	4
7	11/21/08	4/21/19	16- 4.5	1	1
8	11/11/07	5/ 7/19	13- 0	3	3
9	4/29/09	4/21/19	12- 7.5	3	2
10	1/25/08	4/29/19	11- 1	6	6
11	3/31/08	4/23/19	9- 9	6	6
12	6/ 5/08	4/30/19	12- 2	2	2
13	12/30/07	4/23/19	16- 0	2	2
14	5/19/07	5/17/19	13- 0	2	2
15	7/12/08	5/ 7/19	11- 0	3	3
16	12/13/06	5/ 6/19	9- 3	5	5
17	11/27/08	5/ 6/19	9- 3	5	5
18	2/22/10	5/ 7/19	13- 6.5	1	1
19	5/ 3/09	5/ 5/19	10- 4	4	4
20	2/12/07	5/13/19	11- 0	6	5
21	5/18/08	4/22/19	10- 2	6	6
22	5/ 4/07	4/29/19	9- 6	6	6
23	12/ 9/08	5/ 7/19	14- 9	4	4
24	7/24/08	5/ 7/19	11- 0	4	4
25	12/ 5/06	4/29/19	8- 6	5	5
26	8/26/04	4/21/19	10- 0	7	7
27	12/21/06	4/22/19	8- 9	7	7
28	10/ 6/07	4/23/19	8- 6	5	5
29	10/ 6/07	4/23/19	8- 6	6	6
30	9/ 7/08	4/29/19	12- 1.5	5	4
31	1/22/08	4/29/19	10- 4	5	4
32	5/14/08	4/22/19	9-11	4	4
33	6/13/09	4/23/19	11-11.5	4	4
34	8/27/09	4/22/19	9- 4	4	4
35	7/ 6/06	4/29/19	9-11	5	4
36	5/23/09	4/21/19	9- 6	3	3
37	4/22/09	4/21/19	11- 0	3	3
38	10/12/09	4/18/19	10- 8	3	3
39	5/ 8/08	4/14/19	10- 7	4	4
40	8/13/09	4/17/19	11- 6	2	2
41	1/ 9/08	4/22/19	9- 7	4	4
42	10/12/07	4/15/19	8- 9	6	7

TABLE I (Continued)

Fourth Grade

Case	Born	Tested	M.A.	1st Est.	2nd Est.
43	10/16/08	4/16/19	12- 5.5	4	3
44	2/16/09	4/15/19	8- 8	6	6
45	12/10/08	4/15/19	11- 0	4	4
46	5/24/10	4/16/19	10- 4	6	6
47	11/ 2/09	4/15/19	10- 7	6	6
48	7/11/08	4/15/19	9-11	5	5
49	10/29/08	4/21/19	10- 1	3	3
50	1/15/09	4/17/19	11- 7.5	3	3
51	9/12/09	4/30/19	10-10	4	5
52	7/ 2/08	4/30/19	10- 8	4	4
53	8/15/09	4/17/19	13- 3	2	2
54	12/13/09	3/26/19	12-10	2	2
55	4/29/09	4/21/19	10- 8	4	3
56	4/19/09	4/14/19	9- 6	4	4
57	12/29/09	4/17/19	10- 9	2	2
58	3/11/09	4/18/19	9- 6	3	2
59	12/12/08	4/18/19	10- 4	4	3
60	5/ 5/10	4/16/19	10- 2	5	5
61	7/11/09	4/17/19	8- 9	5	5
62	11/ 6/05	4/15/19	11- 0	7	7
63	6/29/08	4/17/19	11- 5	4	4
64	2/27/08	4/16/19	10- 1	4	5
65	11/11/07	4/21/19	9- 6	4	4
66	10/10/09	4/16/19	9- 9	5	5
67	2/ 3/09	4/16/19	9- 9	4	5
68	5/30/09	4/21/19	10- 1	4	5

Table II shows the distribution of the resulting intelligence quotients. (See page 79 for reason for selection of interval.)

TABLE II

Distribution of 364 Binet I. Q.'s.

— to 59	60 to 75	76 to 91	92 to 107	108 to 123	124 to 139	140 —
0	15	83	137	93	23	13

This table shows that the cases used constituted a very symmetrical distribution. This distribution was entirely the result of chance selection. The group below 60 I. Q. was not represented, of course, for intelligence of that grade is usually eliminated from the public school. The slight preponderance of high I. Q.'s was, perhaps, to be expected in the type of school which these children attend.

The work of determining the intelligence quotients was very carefully done. The tests were given partly by the writer and partly by other examiners, all of whom were trained by him. A

common exact procedure was rigidly followed, the responses of the children were written down verbatim, and the writer rescored all papers as carefully and consistently as possible. Where known irregularities of any kind developed the test was discarded.

Previous experience in several schools led to a very careful checking of the chronological ages of the children before such ages were used as a basis for the computation of intelligence quotients. It is a common thing in any public school to find error in from 10 per cent to 15 per cent of records of chronological ages, even when such ages have been furnished by parents. This matter was followed up very carefully, the ages were obtained from two or three different angles, discrepancies noted, and personal work done to establish the facts.

After the intelligence quotients had been computed on the basis of the rescored papers, and the rechecked chronological ages, these quotients were checked by correlation with teachers' estimates of intelligence. For original data on estimates see Table II. The estimates had been obtained previous to the giving of the Binet tests. The procedure used in securing the estimates utilized the following instructions:

In estimating intelligence you are asked to grade on a scale of 1, 2, 3, 4, 5, 6, 7, as follows:

1 = Very superior
2 = Superior
3 = Somewhat above average
4 = Average
5 = Somewhat below average
6 = Inferior
7 = Very inferior

Be sure to take age into account. Compare the child with what you consider to be the average for children of his own age.

Avoid grouping your estimates in one or two groups. Ordinarily the *4* group (average) will be the largest single group. In the majority of classrooms *group 5* should be approximately equal to *group 3, group 6* equal to *group 2,* and *group 7* equal to *group 1.*

Your estimates will be held as absolutely confidential, therefore do not hesitate to place the child in the group where he belongs, however low that may be.

The teachers did not know that they would be asked to make these estimates again; but about one week later they were asked to repeat the process, rating each child with no opportunity for comparison with the former rating. Then Pearson correlations were made for each grade (1) between Binet I. Q. and the grade teacher's first estimate of intelligence, and (2) between Binet I. Q. and the same teacher's second estimate of the same pupils. The results of these correlations are shown in Table III. The coefficients are relatively high, due perhaps (1) to the care with which the I. Q.'s were determined, and (2) to unusual ability in estimation on the part of the teachers.

TABLE III
Correlation of Binet I. Q. with Teachers' Estimates of Intelligence.

Grade	1st Est.	2nd Est.
8	.70	.75
7	.77	.68
6	.70	.69
5	.66	.68
4	.72	.71
All Grades	.69	.69

The probable error of the above shown coefficients is approximately .04 for all except the last, where it drops to less than half that amount. On the basis of the total showing made in the data it was concluded that the determination of the general intelligence of the subjects had been reliably made, and that it was safe to use the results as a criterion in the remainder of the study.

The next step was to give to the same subjects a group intelligence test consisting of twenty single tests, nine of which were predominantly of the perceptual type, and eleven predominantly of the symbol type.* Before these tests could be given the number of subjects in the group had been reduced, by graduation and other factors, to 222. The raw data for the group tests of these 222 subjects is shown in Table IV. The mental ages given in the table are rectified mental ages. They have been brought up to

* Copies of these tests, and also of the tests used in the lower grade investigation, are filed at Stanford University.

date by the usual method based upon (1) the difference between the date of the Binet and the date of the other test, and (2) the theory that the I. Q. (relation of chronological and mental age) remains approximately constant.

TABLE IV, A

Raw Data for the Nine Perceptual Tests.

Eighth Grade.

Case	Group A 1	2	3	4	5	Total	Group B 1	2	3	4	Total	Total	IQ	CA	MA
40	16	8	32	18	20	94	4	10	9	9	32	126	99	15-2	15-0
51	15	9	30	15	8	77	7	9	9	13	38	115	98	17-0	15-8
54	13	11	39	18	9	90	8	8	10	15	41	131	102	14-8	14-10
56	13	11	39	18	7	88	10	5	9	15	39	127	93	15-6	14-4
59	16	11	37	18	20	102	10	10	9	10	39	141	104	14-2	14-8
60	13	7	31	17	6	74	9	7	9	15	40	114	97	16-4	15-10
63	14	9	35	18	7	83	10	10	9	7	36	119	79	17-0	12-9
65	15	11	34	17	14	91	6	9	8	11	34	125	106	14-6	15-4
66	13	8	35	18	15	89	10	7	9	12	38	127	97	13-11	13-5
71	13	10	39	18	16	96	9	7	8	14	38	134	81	15-2	12-4
72	13	12	39	17	14	95	10	9	10	15	44	139	96	15-10	14-3
							Seventh Grade								
2	14	6	35	16	12	83	9	8	10	11	38	121	111	14-2	15-8
3	16	13	37	18	17	101	9	10	10	15	44	145	121	13-9	16-7
4	15	9	30	11	16	81	10	8	6	7	31	112	93	15-8	14-7
5	15	12	39	17	17	100	10	10	10	14	44	144	116	14-7	16-10
6	15	9	32	15	18	89	9	10	9	9	37	126	93	17-2	14-10
7	14	10	29	15	9	77	10	8	10	12	40	117	110	14-1	15-5
11	16	9	37	18	13	93	10	9	9	12	40	133	109	14-11	16-5
12	16	11	35	17	13	92	10	10	10	13	43	135	121	14-0	16-11
13	15	12	38	18	12	95	10	10	9	14	43	138	123	13-3	16-3
14	13	11	32	11	16	83	10	9	9	12	40	123	93	16-0	15-0
17	15	11	38	16	16	96	10	10	10	12	42	138	141	14-0	19-9
18	12	9	31	14	8	74	9	6	8	12	35	109	62	15-10	9-10
19	15	12	32	18	20	97	10	10	10	12	42	139	93	15-1	14-0
21	12	12	35	15	17	91	10	10	8	13	41	132	89	15-4	13-7
22	15	11	37	18	14	95	10	9	8	15	42	137	110	13-11	15-4
23	16	9	26	15	13	79	8	8	9	10	35	114	99	14-5	14-3
24	15	10	28	15	11	79	9	10	9	10	38	117	119	14-3	16-11
25	15	7	27	18	16	83	9	10	9	14	42	125	118	12-11	15-2
26	14	10	36	16	18	94	9	9	9	14	41	135	107	15-3	16-5
27	14	9	26	15	10	74	7	9	8	8	32	106	92	14-0	12-10
30	13	11	39	18	12	93	10	10	9	15	44	137	115	14-0	16-1
31	13	10	32	18	15	88	10	8	9	12	39	127	100	13-11	13-10
33	14	10	35	18	20	97	10	10	10	13	43	140	127	14-0	17-9
35	14	9	36	18	11	88	10	10	10	13	43	131	106	14-1	15-0
37	15	9	25	18	11	78	10	8	8	8	34	112	88	15-8	13-8
38	15	7	32	10	9	73	10	8	9	6	33	106	88	14-9	12-11
39	15	10	24	18	12	79	9	8	10	10	37	116	109	14-5	15-10
40	13	9	26	13	11	72	6	8	3	9	26	98	95	13-3	12-8
41	14	7	29	16	14	80	9	9	10	13	41	121	100	15-9	15-9
42	16	8	37	18	17	96	9	10	10	13	42	138	117	14-5	16-10
43	14	7	22	17	11	71	10	9	9	13	41	112	93	14-5	13-4
45	15	12	32	18	13	90	10	10	9	11	40	130	130	13-0	16-10
46	16	9	28	18	13	84	8	10	9	12	39	123	97	14-2	13-8

TABLE IV, A (Continued)

Seventh Grade

Case	Group A 1	2	3	4	5	Total	Group B 1	2	3	4	Total	Total	IQ	CA	MA
47	14	7	39	16	9	85	10	9	8	10	37	122	80	14-5	11-5
48	16	8	34	14	12	84	10	10	10	10	40	124	148	12-6	18-5
49	14	10	38	18	16	96	8	7	8	14	37	133	91	13-11	12-8
50	12	11	39	18	12	92	10	8	8	13	39	131	114	12-11	14-9
51	15	8	34	17	13	87	9	9	10	10	38	125	74	16-1	12-1
52	14	12	35	18	14	93	10	8	10	14	42	135	114	13-8	15-7
53	15	12	37	18	17	99	10	5	8	12	35	134	99	14-5	14-3
54	13	10	30	16	20	89	9	8	10	10	37	126	83	14-10	12-4
55	14	7	31	17	17	86	10	6	7	14	37	123	84	14-8	12-4
56	12	10	35	15	7	79	10	6	8	9	33	112	122	12-10	15-7
57	14	11	39	13	14	91	10	7	9	14	40	131	93	14-0	13-0
58	16	12	34	18	17	97	10	10	10	14	44	141	113	13-11	15-8
60	15	9	39	15	20	98	10	10	9	15	44	142	121	13-6	16-3
61	13	9	39	18	16	95	9	10	9	10	39	133	112	14-0	15-10
62	12	9	26	18	10	75	9	9	10	10	38	113	93	13-6	12-6
63	9	8	25	14	13	69	10	3	7	9	29	98	88	14-10	13-0
64	14	9	31	12	13	79	10	7	8	14	39	118	92	14-2	13-0
65	15	10	27	17	14	83	9	10	10	9	38	121	128	13-4	17-2
66	12	10	35	18	18	93	10	7	7	11	35	128	110	13-8	15-1
67	16	12	36	16	17	97	10	9	8	14	41	138	122	11-11	14-5

Sixth Grade

1	14	10	39	15	2	80	5	8	9	9	31	111	98	13-4	13-1
2	15	8	20	17	14	74	6	10	9	14	39	113	81	15-5	12-6
3	12	9	37	18	16	92	9	9	8	9	35	127	99	15-7	15-4
6	14	10	33	18	15	90	10	10	8	8	36	126	102	13-5	13-8
7	11	10	28	16	12	77	9	10	6	9	34	111	85	15-4	13-0
8	16	9	31	17	13	86	8	9	10	9	36	122	86	14-10	12-8
9	13	8	37	15	18	91	9	10	9	14	42	133	94	13-10	13-1
10	16	10	35	18	16	95	10	10	9	14	43	138	140	12-4	17-3
12	10	7	31	12	14	74	8	0	5	14	27	101	74	17-0	12-0
13	16	6	30	13	11	76	8	10	12	13	41	117	101	13-3	13-5
14	16	14	39	18	20	107	9	9	9	15	42	149	94	13-11	13-2
15	11	9	35	18	16	89	10	9	10	10	39	128	88	13-10	12-3
16	15	10	37	13	14	89	10	10	9	10	39	128	107	13-8	14-7
17	16	12	39	18	17	102	9	10	10	15	44	146	98	13-11	13-9
18	14	10	39	18	11	92	10	6	6	15	37	129	91	12-10	11-8
21	14	8	39	18	12	91	9	9	7	13	38	129	102	12-0	12-3
22	16	11	37	18	14	96	9	10	9	8	36	132	120	13-10	16-6
23	13	8	24	16	16	77	9	10	9	9	37	114	107	13-3	14-2
24	15	12	39	17	15	98	10	10	10	13	43	141	143	11-8	16-8
25	14	10	32	17	16	89	10	9	10	13	42	131	135	12-8	17-0
26	12	9	34	18	12	85	10	7	9	9	35	120	79	15-0	11-10
27	12	9	37	18	14	88	7	5	7	12	31	119	72	14-3	10-4
30	16	10	35	11	17	89	10	8	10	13	41	130	105	12-10	13-5
32	12	8	30	16	10	76	8	9	8	7	32	108	98	13-9	13-4
35	14	7	28	18	10	77	9	10	9	11	39	116	123	12-11	15-10
36	15	9	37	14	11	86	9	10	9	15	43	129	134	12-3	16-4
38	15	11	37	18	14	95	9	9	9	13	40	135	108	13-7	14-9
39	13	9	29	14	6	71	10	10	4	10	34	105	91	13-3	12-1

TABLE IV, A (Continued)

Sixth Grade

	Group A						Group B								
Case	1	2	3	4	5	Total	1	2	3	4	Total	Total	IQ	CA	MA
41	15	11	39	18	11	94	9	9	9	14	41	135	110	14-3	15-8
42	10	11	37	18	17	93	10	8	7	14	39	132	122	13-9	16-8
43	12	9	36	16	16	89	9	8	8	9	34	123	104	12-10	13-4
44	15	10	29	16	9	79	9	9	10	8	36	115	88	14-11	13-2
45	15	10	32	18	10	85	10	8	10	13	41	126	119	13-9	16-4
46	14	7	28	14	13	76	10	8	8	9	35	111	111	12-11	14-5
47	8	8	25	15	11	67	6	8	7	9	30	97	93	13-5	12-7
49	14	10	30	15	12	81	10	9	0	9	28	109	89	13-3	11-10
50	14	8	31	12	15	80	9	8	8	14	39	119	87	14-5	12-6
51	15	12	29	14	10	80	9	8	10	9	36	116	121	12-7	15-2
52	15	7	23	11	17	73	10	9	9	6	34	107	105	13-1	13-8
54	14	8	27	17	18	84	8	9	8	12	37	121	119	13-7	16-2
55	16	8	24	18	14	80	8	9	7	11	35	115	117	12-7	14-7
56	12	8	33	13	11	77	10	4	7	11	32	109	97	11-9	10-8
57	14	7	39	14	13	87	6	9	7	11	33	120	126	13-11	17-6
58	11	7	19	18	17	72	7	8	3	0	18	90	119	12-3	14-6
59	12	6	26	7	12	63	9	10	8	9	36	99	98	12-11	12-5
61	8	7	25	10	12	62	10	5	8	12	35	97	91	13-2	11-11
66	13	9	39	18	14	93	10	7	10	11	38	131	100	12-1	12-1
67	12	9	27	14	8	70	8	9	4	12	33	103	92	13-1	12-0
70	13	9	39	17	10	88	9	8	0	8	25	113	82	14-10	12-5
71	15	13	30	18	18	94	8	9	10	15	42	136	109	14-1	15-4
72	12	12	30	13	20	87	9	9	8	11	37	124	102	12-9	13-1
73	7	7	34	17	10	75	8	6	7	9	30	105	74	15-2	11-3

Fifth Grade

	Group A						Group B								
Case	1	2	3	4	5	Total	1	2	3	4	Total	Total	IQ	CA	MA
1	7	8	30	11	14	70	9	9	8	11	37	107	105	11-10	12-5
2	14	0	29	18	17	78	9	8	9	9	35	113	97	13-3	12-10
3	13	8	28	13	14	76	8	6	5	12	31	107	84	13-5	11-4
5	9	7	22	10	16	64	9	10	8	10	37	101	80	13-4	10-7
6	13	9	25	12	11	70	9	8	9	11	37	107	94	13-2	12-4
7	15	7	26	14	13	75	9	9	9	9	36	111	152	11-3	17-4
8	14	9	29	18	6	76	9	9	8	12	38	114	105	11-7	12-1
9	14	8	30	13	17	82	7	10	10	4	31	113	127	13-1	16-6
10	11	8	31	18	17	85	10	9	10	15	44	129	117	13-7	15-11
11	14	7	28	8	11	68	8	7	7	6	28	96	93	13-10	12-10
15	12	7	28	11	8	66	9	5	9	8	31	87	80	15-1	12-1
16	14	8	27	17	6	72	9	9	7	12	37	104	98	11-10	11-8
17	14	6	30	14	14	78	9	9	6	11	35	113	84	13-3	11-2
18	14	7	27	17	18	83	8	8	7	11	34	117	118	12-1	14-3
19	12	8	28	14	14	76	9	10	8	4	31	107	116	12-7	14-6
20	12	10	22	16	15	75	10	8	10	8	36	111	110	12-6	13-9
21	15	9	27	15	18	84	9	9	9	10	37	121	86	15-3	13-3
22	14	8	32	17	11	82	9	10	8	10	37	119	151	10-9	16-3
23	13	9	32	11	15	80	10	9	9	9	37	117	98	12-9	12-5
24	12	7	30	15	16	80	10	9	10	13	42	121	103	11-9	12-1
25	14	12	39	18	14	97	10	10	9	13	42	139	95	12-2	11-8
26	13	9	27	11	10	70	9	9	7	5	30	100	97	12-6	12-2
27	13	9	31	12	14	79	9	5	6	10	30	109	85	14-2	12-0

TABLE IV, A (Continued)
Fifth Grade (Continued)

Case	Group A 1	2	3	4	5	Total	Group B 1	2	3	4	Total	Total	IQ	CA	MA
29	12	10	27	12	18	79	10	7	1	13	31	110	94	12-1	11-5
30	13	8	25	14	15	75	10	9	9	12	40	115	113	12-1	13-7
31	12	9	21	9	11	62	5	9	10	8	32	94	88	14-3	12-6
32	13	9	24	9	12	67	7	10	6	11	34	101	113	11-4	12-10
33	14	7	33	15	7	76	9	5	5	8	27	103	100	11-6	11-7
35	14	8	28	16	15	81	8	9	10	15	42	123	194	12-5	12-11
36	15	8	25	12	9	69	9	6	7	7	29	98	90	12-10	11-7
38	12	10	34	11	11	78	9	10	7	9	35	113	91	12-4	11-3
39	14	9	22	13	10	68	8	9	5	9	31	99	108	12-6	13-6
40	13	9	39	17	13	91	10	8	7	8	33	124	106	11-5	12-1
41	9	8	24	15	14	70	10	8	10	8	36	106	126	11-7	14-6
44	14	9	20	11	16	70	9	7	9	9	34	104	116	11-2	12-11
45	14	9	28	15	12	78	9	9	8	7	33	111	105	12-2	12-8
46	14	7	26	15	14	76	10	9	10	9	38	114	143	10-8	15-3
47	9	9	26	18	14	76	10	7	8	8	33	109	111	11-5	12-8
51	14	9	22	18	0	63	8	8	8	0	24	87	76	13-8	10-5
52	15	7	27	10	11	70	8	9	7	8	32	102	89	13-5	11-11
53	12	7	39	13	13	84	9	10	0	8	27	111	93	13-9	11-10
54	13	7	20	11	9	60	10	10	7	8	35	95	136	11-6	15-8
55	13	9	26	10	1	59	9	8	7	11	35	94	82	12-7	10-4
56	14	8	27	10	11	60	8	5	6	9	28	88	109	11-8	12-8
57	12	8	27	14	17	78	8	8	8	9	33	111	85	13-11	11-9
58	13	7	25	12	14	71	9	9	6	6	30	101	106	10-8	11-3
59	15	8	28	16	20	87	9	10	8	12	39	126	84	13-2	11-2
61	16	8	26	14	13	77	8	8	9	10	35	112	88	11-9	10-3
62	10	8	23	9	12	62	5	10	7	9	31	93	93	11-4	10-6
63	13	6	25	15	11	70	6	10	8	14	38	108	95	10-9	10-3
64	14	9	23	9	15	70	7	10	8	8	33	103	98	11-8	11-5
65	11	7	25	11	0	54	10	6	7	8	31	85	91	11-2	10-1
67	15	9	32	15	11	82	7	8	8	15	38	120	95	11-6	11-0
68	13	10	37	15	12	87	5	7	8	10	30	117	93	11-10	11-0
69	15	6	37	14	12	84	6	7	8	15	36	120	75	13-6	10-1
70	9	7	31	14	0	61	8	8	10	9	35	96	94	11-11	11-2
71	14	9	21	12	5	61	10	10	8	11	39	100	162	11-2	18-0
74	10	8	26	11	4	49	9	8	8	12	37	86	83	12-2	10-1
75	14	9	36	15	9	83	7	8	8	13	36	119	100	11-9	11-9
78	14	8	27	18	17	84	8	8	9	13	38	122	95	11-9	11-2
79	13	7	35	13	7	75	9	8	8	11	36	111	89	12-7	11-2

Fourth Grade

1	14	6	21	10	13	64	5	8	9	10	32	96	108	11-3	12-2
2	15	7	23	5	0	50	8	7	6	8	29	79	88	11-1	9-9
5	11	7	26	10	14	68	8	10	8	6	32	100	126	11-3	14-0
6	13	8	25	13	11	70	9	10	4	13	36	106	103	11-4	11-8
9	11	8	25	16	14	74	8	6	10	13	37	111	126	10-8	13-4
10	14	7	22	11	18	72	10	9	9	10	38	110	99	11-11	11-9
11	13	9	28	18	16	84	9	10	9	8	36	120	88	11-9	10-4
13	15	11	29	18	16	89	10	10	10	13	43	132	141	12-0	16-10
14	13	9	25	10	12	69	8	10	9	8	35	104	108	12-7	13-8
15	13	8	21	14	11	67	9	9	6	12	36	103	102	11-5	11-7
17	12	8	31	16	12	79	7	6	9	8	30	109	89	11-0	9-9
18	13	11	31	13	17	85	8	10	10	13	41	126	148	9-9	14-4
19	13	9	32	13	14	81	6	9	8	11	34	115	100	10-7	10-11

TABLE IV, A (Continued

Fourth Grade (Continued)

	Group A						Group B								
Case	1	2	3	4	5	Total	1	2	3	4	Total	Total	IQ	CA	MA
20	13	8	21	15	14	71	8	8	5	14	35	106	90	12-10	11-6
21	9	8	21	9	4	51	8	8	3	6	25	76	93	11-7	10-9
22	13	5	28	10	11	67	9	7	7	10	33	100	79	12-7	10-0
23	15	8	25	13	13	74	7	10	8	7	32	106	138	11-0	15-6
25	10	7	19	4	13	53	8	7	0	8	23	76	69	12-11	8-11
27	16	4	17	12	8	57	4	5	2	5	16	73	70	13-0	9-3
28	11	8	25	10	7	61	8	4	1	12	25	86	73	12-3	9-0
29	13	5	23	12	3	56	9	4	2	10	25	81	73	12-3	9-0
30	14	7	30	14	17	82	9	7	8	11	35	117	114	11-3	12-9
31	15	7	19	15	12	68	4	7	10	9	30	98	92	11-10	10-10
32	12	6	18	12	7	55	10	10	8	12	40	95	91	11-7	10-6
33	12	9	30	17	13	81	8	6	8	8	30	111	121	10-6	12-8
35	13	7	25	10	12	67	8	8	8	6	30	97	77	13-5	10-4
38	14	8	24	17	13	76	6	8	9	8	31	107	112	10-2	11-5
40	14	7	25	18	14	78	6	9	8	12	35	113	119	10-4	12-4
46	10	5	18	0	4	37	10	6	6	6	28	65	116	9-7	11-1
47	9	9	25	12	12	67	9	9	8	7	33	100	112	10-1	11-4
48	12	2	23	7	0	44	6	6	2	6	20	64	92	11-5	10-6
49	14	7	24	9	12	66	9	8	4	6	27	93	96	11-2	10-9
51	11	7	24	9	11	62	9	7	9	13	38	100	112	10-4	11-7
52	11	8	27	15	11	72	8	7	7	13	35	107	98	11-5	11-3
54	12	7	26	11	13	69	8	9	7	6	30	99	138	9-11	13-8
55	10	7	28	12	13	70	8	7	9	10	34	104	107	10-8	11-5
57	15	7	37	13	7	74	9	9	7	7	32	111	116	10-0	11-6
58	12	6	19	13	13	63	6	8	7	5	26	89	94	10-9	10-1
59	15	10	21	15	11	72	10	9	8	7	34	106	100	11-0	11-0
60	10	7	27	9	11	64	9	8	6	4	27	91	114	9-7	10-11
61	11	7	28	13	11	70	9	8	5	11	33	103	90	10-5	9-4
62	8	6	22	8	3	47	7	4	6	3	20	67	82	14-1	11-6
64	11	7	21	13	14	66	9	9	8	6	32	98	91	11-9	10-8
65	12	9	29	14	14	78	9	9	9	13	40	118	82	12-1	10-0
66	9	7	19	8	12	55	8	0	6	7	21	76	103	10-2	10-5

TABLE IV, B

Raw Data for the Eleven Symbol Tests.

Eighth Grade

	Group A							Group B								
Case	1	2	3	4	5	6	Total	1	2	3	4	5	Total	Total	IQ	CA	MA
40	8	7	23	25	9	22	94	14	31	10	10	22	87	181	99	15-2	15-0
51	7	6	33	28	10	11	95	11	32	9	17	18	87	182	98	17-0	15-10
54	7	7	27	28	14	21	104	14	30	9	13	21	87	191	102	14-8	14-10
56	7	7	16	22	10	18	80	14	16	7	11	18	66	146	93	15-6	14-4
59	11	8	19	31	13	21	103	15	32	9	15	20	91	194	104	14-2	14-8
60	5	7	14	25	9	14	74	10	22	9	10	15	66	140	97	16-4	15-10
63	6	7	14	21	9	11	68	10	27	9	7	11	64	132	79	17-0	12-9
65	6	9	34	35	15	22	121	10	33	9	19	21	92	213	106	14-6	15-4
66	5	5	16	20	9	15	70	12	22	8	10	12	64	134	97	13-11	13-5
71	8	9	19	23	9	14	82	14	32	10	13	16	85	167	81	15-2	12-4
72	4	8	22	26	15	17	92	12	28	8	15	23	86	178	96	15-10	14-3

TABLE IV, B (Continued)
Seventh Grade

Case	Group A 1	2	3	4	5	6	Total	Group B 1	2	3	4	5	Total	Total	IQ	CA	MA
2	9	8	20	26	13	15	91	14	25	8	14	18	79	170	111	14-2	15-8
3	10	9	33	24	16	22	114	14	30	10	10	21	85	199	121	13-9	16-7
4	6	6	21	28	8	14	83	10	25	8	10	17	70	153	93	15-11	14-7
5	13	9	30	38	13	23	126	14	36	10	14	22	96	222	116	14-7	16-10
6	10	7	24	27	10	20	98	13	25	9	11	15	73	171	93	17-2	14-10
7	9	7	19	25	10	22	92	12	24	9	9	21	75	167	110	14-1	15-5
11	5	8	14	29	8	19	83	10	20	9	11	18	68	151	109	14-11	16-5
12	10	7	25	31	11	20	104	14	36	10	13	21	94	198	121	14-0	16-11
13	7	7	27	38	15	22	116	15	33	10	15	23	96	212	123	13-3	16-3
14	6	8	17	24	9	18	82	15	29	9	13	17	83	165	93	16-0	15-0
17	10	8	23	35	14	23	113	12	34	10	17	16	89	202	141	14-0	19-9
18	3	5	9	10	6	9	42	10	17	5	8	9	49	91	62	15-10	9-10
19	8	8	24	30	13	19	102	13	34	9	14	18	88	190	93	15-1	14-0
21	5	7	17	13	11	15	68	11	25	9	13	14	72	140	89	15-4	13-7
22	6	7	19	26	11	23	92	14	31	10	12	18	85	177	110	13-11	15-4
23	9	8	27	26	11	20	101	13	26	10	9	19	77	178	99	14-5	14-3
24	8	8	17	27	11	14	85	10	28	10	13	18	79	164	119	14-3	16-11
25	10	6	23	30	6	19	94	14	29	9	8	11	71	165	118	12-11	15-2
26	10	9	23	21	9	21	93	11	18	7	13	19	68	161	107	15-3	16-5
27	8	9	22	28	6	19	92	10	19	6	10	17	62	154	92	14-0	12-10
30	11	9	22	31	14	21	108	16	32	8	13	20	89	197	115	14-0	16-1
31	2	8	24	33	11	18	96	15	25	9	12	15	76	172	100	13-11	13-10
33	7	8	19	35	9	23	101	15	33	10	13	18	89	190	127	14-0	17-9
35	5	8	12	26	5	17	73	11	15	7	6	9	48	121	106	14-1	15-0
37	5	6	15	22	8	17	73	13	21	9	13	18	74	147	88	15-8	13-8
38	7	6	25	24	9	14	85	9	28	8	13	11	69	154	88	14-9	12-11
39	8	7	21	27	9	22	94	11	21	8	14	18	72	166	109	14-5	15-10
40	6	8	18	27	10	17	86	9	25	8	9	17	68	154	95	13-3	12-8
41	6	8	24	26	10	19	93	11	19	8	7	20	65	158	100	15-9	15-9
42	7	6	29	25	13	15	95	13	28	9	13	22	85	180	117	14-5	16-10
43	6	8	21	24	9	22	90	11	27	7	7	19	71	161	93	14-5	13-4
45	8	8	24	29	11	21	101	13	34	9	10	18	84	185	130	13-3	16-10
46	8	7	15	18	10	14	72	11	12	6	10	21	60	132	97	14-2	13-8
47	6	6	14	19	9	15	69	13	23	9	11	15	71	140	80	14-5	11-5
48	10	9	32	34	15	21	121	16	39	10	12	22	99	220	148	12-6	18-5
49	5	8	21	22	10	17	83	13	33	9	11	20	86	169	91	13-11	12-8
50	9	9	28	31	13	22	112	14	36	10	14	22	96	208	114	12-11	14-9
51	5	7	21	25	9	14	81	10	24	6	12	13	65	146	74	16-1	12-1
52	10	8	22	27	11	21	99	12	22	10	12	15	71	170	114	13-8	15-7
53	7	8	15	23	7	17	77	13	17	8	9	17	64	141	99	14-5	14-3
54	3	7	11	12	6	11	50	7	21	7	10	15	60	110	83	14-10	12-4
55	7	7	23	26	13	13	89	12	24	9	13	18	76	165	84	14-8	12-4
56	6	7	17	24	10	15	79	12	20	8	15	16	71	150	122	12-10	15-7
57	7	8	17	28	12	18	90	10	27	9	17	14	77	167	93	14-0	13-0
58	8	8	26	27	12	22	103	11	32	9	14	22	88	191	113	13-11	15-8
60	8	7	25	31	10	20	101	12	36	8	8	21	85	186	121	13-6	16-3
61	3	8	16	24	11	17	79	11	30	10	15	16	82	161	112	14-0	15-10
62	6	7	24	27	9	15	88	12	28	9	6	22	77	165	93	13-6	12-6
63	6	7	19	25	10	17	84	12	25	8	9	14	68	152	88	14-10	13-0
64	4	8	13	16	10	16	67	9	20	10	12	21	72	139	92	14-2	13-0
65	9	6	27	38	13	21	114	12	34	10	21	14	91	205	128	13-4	17-2
66	6	8	18	25	14	19	90	15	20	9	13	19	76	166	110	13-8	15-1
67	5	8	25	26	14	21	99	9	29	10	15	20	83	182	122	11-11	14-5

TABLE IV, B (Continued)
Sixth Grade

	Group A							Group B								
Case	1	2	3	4	5	6	Total	1	2	3	4	5	Total	Total	IQ	CA	MA
1	6	7	17	20	7	17	74	9	27	7	9	16	68	142	98	13-4	13-1
2	3	7	15	22	8	13	68	8	23	6	9	19	65	133	81	15-5	12-6
3	8	4	22	25	11	15	85	12	27	9	8	19	75	160	99	15-7	15-4
6	8	8	16	32	11	20	95	13	34	10	10	19	86	181	102	13-5	13-8
7	4	3	7	18	5	12	49	9	19	8	7	12	55	104	85	15-4	13-0
8	5	7	17	21	11	19	80	12	21	9	5	12	59	139	86	14-10	12-8
9	6	8	15	16	8	16	69	10	25	5	6	18	64	133	94	13-10	13-1
10	9	8	25	34	14	12	102	11	34	10	14	20	89	191	140	12-4	17-3
12	1	6	17	22	10	17	73	11	16	7	7	15	56	129	74	17-0	12-0
13	3	7	18	15	10	21	74	13	19	9	11	18	70	144	101	13-3	13-5
14	6	9	15	15	11	12	68	12	19	9	12	15	67	135	94	13-11	13-2
15	4	7	20	24	9	11	75	12	31	9	13	19	84	159	88	13-10	12-3
16	7	9	26	38	13	18	111	11	31	7	8	19	76	187	107	13-8	14-7
17	5	7	22	21	11	18	84	12	19	10	13	19	73	157	98	13-11	13-9
18	4	8	16	24	12	13	77	14	27	6	14	18	79	156	91	12-10	11-8
21	6	6	12	27	10	16	77	10	18	9	9	16	62	139	102	12-0	12-3
22	8	9	22	32	14	18	103	11	28	10	10	16	75	178	120	13-10	16-6
23	7	6	12	22	10	15	72	10	23	8	8	16	65	137	107	13-3	14-2
24	8	9	24	30	13	21	105	11	36	10	13	22	92	197	143	11-8	16-8
25	9	8	14	27	11	18	87	14	28	10	11	17	78	165	135	12-8	17-0
26	8	6	9	14	8	14	59	12	23	6	9	11	61	120	79	15-0	11-10
27	3	7	16	19	8	13	66	12	20	8	10	17	67	133	72	14-3	10-4
30	5	9	24	25	10	9	82	10	33	7	15	19	84	166	105	12-10	13-5
32	5	7	14	23	10	12	71	11	28	7	10	19	75	146	98	13-9	13-4
35	10	9	20	27	9	20	95	11	26	10	10	18	75	170	123	12-11	15-10
36	8	7	28	22	14	19	98	10	34	9	15	22	90	188	134	12-3	16-4
38	8	8	23	24	7	19	89	11	26	10	14	18	79	168	108	13-7	14-9
39	4	8	26	25	12	15	90	10	26	9	13	21	79	169	91	13-3	12-1
41	5	8	24	38	13	17	105	14	30	9	18	22	93	198	110	14-3	15-8
42	6	7	20	20	13	18	84	10	29	8	13	20	80	164	122	13-9	16-8
43	7	7	15	21	10	16	76	10	26	10	10	17	73	149	104	12-10	13-4
44	8	5	10	28	8	16	75	11	23	5	9	16	64	139	88	14-11	13-2
45	9	7	18	28	9	17	88	12	27	9	14	22	84	172	119	13-9	16-4
46	8	8	16	28	10	12	82	13	28	8	11	15	75	157	111	12-11	14-5
47	4	7	11	21	8	15	66	9	20	9	7	12	57	123	93	13-5	12-7
49	8	7	15	26	10	17	83	12	24	7	12	15	70	153	89	13-3	11-10
50	5	7	19	17	10	15	73	12	30	9	10	15	76	149	87	14-5	12-6
51	9	8	19	30	10	22	98	11	34	10	5	18	78	176	121	12-7	15-2
52	5	7	10	21	5	10	58	11	20	9	8	12	60	118	105	13-1	13-8
54	7	7	21	27	11	22	95	10	35	9	9	16	79	174	119	13-7	16-2
55	6	6	9	18	9	13	61	10	19	8	10	15	62	123	117	12-7	14-7
56	5	7	17	22	8	8	67	11	22	6	11	17	67	134	97	11-9	10-8
57	9	8	18	31	12	21	99	11	23	10	13	23	80	179	126	13-11	17-6
58	9	5	25	23	10	17	89	11	30	7	10	11	69	158	119	12-3	14-6
59	6	5	8	18	4	14	55	10	17	7	9	12	55	110	96	12-11	12-5
61	6	6	12	25	10	17	76	8	20	10	12	16	66	142	91	13-2	11-11
66	4	6	13	24	11	22	80	10	23	6	13	17	69	149	100	12-1	12-1
67	5	5	8	19	7	11	55	8	17	6	7	8	46	101	92	13-1	12-0
70	4	7	10	0	11	10	42	11	20	5	9	13	58	100	82	14-10	12-5
71	6	9	17	18	11	21	82	11	22	9	9	21	72	154	109	14-1	15-4
72	4	6	14	12	9	17	62	10	22	7	6	17	62	124	102	12-9	13-1
73	2	5	13	19	8	11	58	11	26	6	11	12	66	124	74	15-2	11-3

TABLE IV, B (Continued)
Fifth Grade

	Group A							Group B									
Case	1	2	3	4	5	6	Total	1	2	3	4	5	Total	Total	IQ	CA	MA
1	6	8	13	20	8	16	71	11	22	7	12	3	55	126	105	11-10	12-5
2	7	6	14	22	9	10	68	11	27	6	8	15	67	135	97	13-3	12-10
3	3	3	11	20	5	8	50	5	19	5	8	12	49	99	84	13-5	11-4
5	6	6	14	20	8	10	64	9	21	6	9	10	55	119	80	13-4	10-7
6	7	8	13	20	7	15	70	10	19	9	10	12	60	130	94	13-2	12-4
7	11	7	20	28	14	22	102	10	31	10	9	12	72	174	152	11-3	17-4
8	7	7	18	22	10	17	81	10	18	7	9	18	62	143	105	11-7	12-1
9	7	7	20	31	12	14	91	6	26	8	16	19	75	166	127	13-1	16-6
10	7	9	25	31	13	21	106	10	39	8	11	22	90	196	117	13-7	15-11
11	4	4	6	16	7	11	48	9	18	7	9	12	55	103	93	13-10	12-10
15	8	5	12	14	9	5	53	9	16	3	7	12	47	100	80	15-1	12-1
16	5	6	12	22	8	15	68	12	21	8	11	13	65	133	98	11-10	11-8
17	5	6	13	17	9	12	62	8	23	7	13	17	68	130	84	13-3	11-2
18	3	7	16	23	8	12	69	12	25	7	11	19	74	143	118	12-1	14-3
19	12	8	21	28	11	21	101	12	32	10	15	21	90	191	116	12-7	14-6
20	8	7	18	27	11	22	93	9	33	9	15	20	86	179	110	12-6	13-9
21	4	8	16	22	10	11	71	8	26	9	10	16	69	140	86	15-3	13-3
22	7	7	24	38	10	19	105	12	34	10	16	17	89	194	151	10-9	16-3
23	4	8	16	17	10	15	70	10	22	8	9	15	64	134	98	12-9	12-5
24	7	7	14	25	11	14	78	11	23	9	10	15	68	146	103	11-9	12-1
25	8	8	15	24	9	20	84	9	27	9	9	14	68	152	95	12-2	11-8
26	4	7	9	14	9	9	52	10	18	5	9	13	55	107	97	12-6	12-2
27	3	7	13	21	10	15	69	9	18	5	9	11	52	121	85	14-2	12-0
29	5	7	18	15	7	12	64	9	16	8	6	9	48	112	94	12-1	11-5
30	7	8	24	30	10	20	99	11	28	9	13	12	73	172	113	12-1	13-7
31	6	2	15	6	5	14	48	10	17	5	8	8	48	96	88	14-3	12-6
32	7	7	25	27	12	18	96	12	25	10	8	18	73	169	113	11-4	12-10
33	4	7	9	19	8	12	59	10	17	9	7	12	55	114	100	11-6	11-7
35	5	6	18	26	11	18	86	12	24	7	11	16	70	156	104	12-5	12-11
36	3	6	14	25	9	12	69	9	25	7	13	15	69	138	90	12-10	11-7
38	7	7	12	14	9	10	59	11	23	6	9	11	60	119	91	12-4	11-3
39	5	4	11	16	8	12	56	8	27	7	9	16	67	123	108	12-6	13-6
40	7	7	13	21	8	17	73	10	25	8	12	15	70	143	106	11-5	12-1
41	8	6	12	25	10	21	82	7	29	9	8	15	68	150	126	11-7	14-6
44	4	7	10	17	8	17	63	7	18	7	10	16	58	121	116	11-2	12-11
45	4	7	13	24	7	18	73	8	23	8	11	17	67	140	105	12-2	12-8
46	6	8	14	23	12	18	81	12	26	8	13	16	75	156	143	10-8	15-3
47	4	7	18	27	9	15	80	9	22	10	8	14	63	143	111	11-5	12-8
51	7	6	10	18	3	6	50	8	14	3	9	12	46	96	76	13-8	10-5
52	5	5	17	20	9	2	58	9	19	6	6	12	52	110	89	13-5	11-11
53	8	3	4	15	9	13	52	8	19	4	8	9	48	100	93	12-9	11-10
54	9	6	20	23	11	19	88	11	24	9	11	19	74	162	136	11-6	15-8
55	4	6	14	14	8	6	52	7	17	5	11	18	58	110	82	12-7	10-4
56	8	5	21	14	7	13	68	12	25	5	7	18	67	135	109	11-8	12-8
57	6	5	3	11	5	8	38	6	18	4	8	11	47	85	85	13-11	11-9
58	6	6	15	26	9	15	77	11	27	8	8	16	70	147	106	10-8	11-3
59	3	4	5	7	4	5	28	8	14	3	3	9	37	65	84	13-2	11-2
61	4	5	11	13	6	13	52	9	16	5	7	12	49	101	88	11-9	10-4
62	3	5	10	13	6	10	47	1	13	3	8	13	38	85	93	11-4	10-6
63	4	6	15	11	8	14	58	8	18	1	11	13	51	109	95	10-9	10-3
64	6	4	14	21	9	17	71	6	19	6	11	18	60	131	98	11-8	11-5
65	3	4	5	13	5	4	35	4	14	5	8	9	40	74	91	11-2	10-1
67	4	6	15	0	6	14	45	10	11	4	0	17	42	87	95	11-6	11-0
68	5	7	10	14	7	1	44	10	10	6	11	15	52	96	93	11-10	11-0
69	5	5	12	10	8	13	53	6	17	6	10	13	52	105	75	13-6	10-1

TABLE IV, B (Continued)
Fifth Grade (Continued)

	Group A							Group B								
Case	1	2	3	4	5	6	Total	1	2	3	4	5	Total	Total	IQ	CA	MA
70	5	5	10	5	6	9	40	8	14	5	8	12	47	87	94	11-11	11-2
71	6	6	26	29	9	20	96	9	29	9	10	14	71	167	162	11-2	18-0
74	6	3	8	9	5	13	44	9	17	5	8	12	51	95	83	12-2	10-1
75	4	5	10	16	5	13	53	11	13	4	6	9	43	96	100	11-9	11-9
78	3	3	5	4	3	5	23	8	14	2	4	11	39	62	95	11-9	11-2
79	2	4	3	17	11	16	53	9	14	5	6	17	51	104	89	12-7	11-2
								Fourth Grade								
1	5	4	2	14	4	8	37	10	18	4	6	9	47	84	108	11-3	12-1
2	6	5	9	18	6	5	49	5	20	4	8	11	48	97	88	11-1	9-10
5	5	8	10	18	6	8	55	9	30	10	10	15	74	129	126	11-3	13-11
6	4	4	10	20	5	13	56	8	18	4	6	11	47	103	103	11-4	11-8
9	4	7	15	19	8	15	68	8	19	7	10	16	60	128	126	10-8	13-3
10	4	5	11	14	8	11	53	7	20	5	12	17	61	114	99	11-11	11-9
11	2	4	9	10	2	14	41	5	15	4	8	14	46	87	88	11-9	10-5
13	8	8	21	29	9	19	94	8	24	7	15	22	76	170	141	12-0	16-8
14	4	5	10	27	9	12	67	9	18	8	10	14	59	126	108	12-7	13-7
15	5	5	10	17	7	14	58	6	20	6	8	17	57	115	102	11-5	11-7
17	6	6	8	19	7	15	61	9	21	9	8	15	62	123	89	11-0	9-10
18	7	8	25	30	13	21	104	10	28	10	7	19	74	178	148	9-9	14-1
19	6	7	16	18	9	13	69	9	21	10	11	18	69	138	100	10-7	10-7
20	6	4	9	19	6	14	58	9	13	4	8	14	48	106	90	12-10	11-7
21	6	4	4	19	4	13	50	8	17	6	9	10	50	100	93	11-7	10-10
22	4	6	9	4	6	4	33	7	16	3	9	18	53	86	79	12-7	10-1
23	5	6	17	22	7	16	73	8	30	9	10	16	73	146	138	11-0	15-4
25	4	3	10	19	4	1	41	5	6	3	11	13	38	79	69	12-11	9-1
27	3	6	8	17	8	9	51	5	16	5	8	10	44	95	70	13-0	9-5
28	0	2	12	10	7	6	37	7	16	4	7	9	43	80	73	12-3	9-2
29	0	2	3	0	2	5	12	7	13	2	2	4	28	40	73	12-3	9-2
30	5	5	8	13	5	10	46	8	16	4	7	12	47	93	114	11-3	12-8
31	4	6	11	13	7	14	55	8	16	3	8	9	44	99	92	11-10	10-11
32	4	5	9	13	6	14	51	8	20	5	5	10	48	99	91	11-7	10-7
33	6	5	11	17	6	13	58	9	14	5	10	14	52	110	121	10-6	12-7
35	3	6	6	17	6	15	53	8	16	7	6	12	49	102	77	13-5	10-6
38	2	8	15	18	9	11	63	8	23	7	14	20	72	135	112	10-2	11-4
40	7	7	17	15	11	12	69	9	18	8	15	13	63	132	119	10-4	12-2
46	6	3	7	14	6	5	41	8	18	4	5	10	45	86	116	9-7	11-0
47	4	7	8	21	8	10	58	8	22	7	8	16	61	119	112	10-1	11-3
48	3	5	13	11	7	8	47	6	15	5	7	12	45	92	92	11-5	10-7
49	4	5	13	16	6	11	55	8	19	5	8	14	54	109	96	11-2	10-9
51	2	5	5	12	3	8	35	8	19	1	1	9	38	73	112	10-4	11-6
52	6	5	12	14	8	4	49	0	16	7	11	15	49	98	98	11-5	11-3
54	1	7	18	25	12	19	82	9	24	9	11	18	71	153	139	9-11	13-6
55	4	3	6	14	4	9	40	7	19	3	5	10	44	84	107	10-8	11-4
57	6	8	16	29	9	16	84	11	24	8	8	12	63	147	116	10-0	11-5
58	3	4	8	12	6	13	46	6	18	3	6	11	44	90	94	10-9	10-2
59	4	5	10	17	6	16	58	9	19	6	10	13	57	115	100	11-0	11-0
60	3	6	12	23	6	11	61	7	22	7	7	16	59	120	114	9-7	10-10
61	4	4	10	8	3	8	37	7	17	2	8	5	39	76	90	10-5	9-5
62	2	4	4	11	5	10	36	8	14	5	3	8	38	74	82	14-1	11-8
64	2	4	6	1	5	11	29	9	17	2	8	9	45	74	91	11-9	10-9
65	4	5	3	19	10	10	51	7	17	5	7	12	48	99	82	12-1	10-2
66	1	3	7	16	5	10	42	8	16	5	6	9	44	86	103	10-2	10-5

The first evidence drawn from these data in favor of the theory of levels in intentionally controlled intelligence was found in certain correlations made between the results of the individual and the combined group tests with Binet mental age. A table of these correlations is given below.

TABLE V

Correlation Coefficients of the Individual and Combined Group Tests with Binet Mental Age.

I.	Perceptual Tests.		II.	Symbol Tests.	
I.	Picture Completion	.42	I.	Arithmetical Reasoning	.63
II.	Series Completion	.46	II.	Written Directions	.58
III.	Comparison	.40	III.	Information	.68
IV.	Symbol Digit	.45	IV.	Synonym-Antonym	.65
V.	Form Combination	.34	V.	Practical Judgment	.65
VI.	Copying Designs	.30	VI.	Analogies	.68
VII.	Pictorial Sequence	.43	VII.	Arithmetical Fundamentals	.59
VIII.	Pictorial Identities	.46	VIII.	Vocabulary	.75
IX.	Recognitive Memory	.29	IX.	Sentence Completion	.68
			X.	Mixed up Sentences	.53
			XI.	Logical Selection	.60
	Total Perceptual	.60		Total Symbol	.80

The tests featured in the foregoing table are those used by the National Research Council in their preliminary trials for the standardization of an elementary school group test. The writer is fully aware that it is psychologically impossible to make an absolute classification of tests as "perceptual" tests and "symbol" tests. Each test is of both types to a certain degree. But it is possible to classify the tests as predominantly of one type or the other, which is all that is necessary to bring out the point in question. Assuming that this is so, the results given in the table show a decided tendency in favor of the theory being tested. The tests in which perceptual elements predominate do not correlate as highly in any case with Binet mental age as do the tests in which symbol elements predominate. The perceptual tests as a battery correlate only .60, while the symbol tests as a battery correlate .80.

The majority of the individual symbol tests taken singly correlate higher with Binet mental age than does the whole battery of perceptual tests. The vocabulary test alone, perhaps the most abstract of all, shows a coefficient which is 15 points above

the whole perceptual battery. These differences cannot reasonably be ascribed to mere differences in the amount of standardization which the given tests have had. They have had at least approximately equal standardization. Nor can the differences reasonably be ascribed to differences in reliability of the individual tests, although if time and other conditions had permitted the computation of reliability coefficients would have been a valuable addition to the evidence. The differences shown in the table are, however, so large that it seems a reasonable assumption that they are due, at least in part, to the fact that the two types of tests tap different levels of intelligence, and that on one of these levels, the perceptual, high and low intelligence are closer together in achievement than on the other, and therefore are not so well differentiated by tests which tap only that level.

The next step was that of making a more definite contrast between the achievement of high and low intelligence in the perceptual tests and in the symbol tests. The cases were first distributed as to chronological age and I. Q. as shown in Table VI.

After the cases had been distributed as to chronological age and I. Q., as shown in Table VI, a contrast was made as shown in Table VII. Middle I. Q.'s—those between 92 and 107 inclusive—were dropped; and the achievement of I. Q. below 92 was contrasted with the achievement of I. Q. above 107. The limits of the central group (a span of 15 points from 92 to 107) were chosen rather arbitrarily (1) because seven groups arranged in intervals of 15 points of I. Q. fit very well with the seven point scale upon which teachers' judgments of intelligence were made, and (2) because by actual attempts at distribution, groups based upon intervals of 20 points proved to be too wide, while those based upon intervals of 10 points were too narrow. The contrast was made separately for the perceptual tests as a group, and for the symbol tests as another group. That is, the total scores of the low I. Q.'s in the perceptual tests were ranked and the median score found. The same was done for the scores of the high I. Q.'s in the same tests. Then the median score for low I. Q. was divided by the median score for high I. Q. Thus there was developed a ratio (or index) of the relative success of

TABLE VI
Chronological Age and Binet I. Q.

10			11			12			13			14		
No.	Yrs.	I.Q.	No.	Yrs.	I.Q.	No.	Yrs.	I.Q.	No.	Yrs.	I.Q.	No.	Yrs.	I.Q.
Fourth Grade			*Fourth Grade*			*Fourth Grade*			*Fourth Grade*			*Fourth Grade*		
9	10-8	126	1	11-3	108	13	12-0	141	27	13-0	70	62	14-1	82
19	10-7	100	2	11-1	88	14	12-7	108	35	13-5	77	*Fifth Grade*		
33	10-6	121	5	11-3	126	20	12-10	90	*Fifth Grade*			27	14-2	85
38	10-2	112	6	11-4	103	22	12-7	79	2	13-3	97	31	14-3	88
40	10-4	119	10	11-11	99	25	12-11	69	3	13-5	84	*Sixth Grade*		
47	10-1	112	11	11-9	88	28	12-3	73	5	13-4	80	8	14-10	86
51	10-4	112	15	11-5	102	29	12-3	73	6	13-2	94	27	14-3	72
55	10-8	107	17	11-0	89	65	12-1	82	9	13-1	127	41	14-3	110
57	10-0	116	21	11-7	93	*Fifth Grade*			10	13-7	117	44	14-11	88
58	10-9	94	23	11-0	138	18	12-1	118	11	13-10	93	50	14-5	87
61	10-5	90	30	11-3	114	19	12-7	116	17	13-3	84	70	14-10	82
66	10-2	103	31	11-10	92	20	12-6	110	51	13-8	76	71	14-1	109
Fifth Grade			32	11-7	91	23	12-9	98	52	13-5	89	*Seventh Grade*		
22	10-9	151	48	11-5	92	25	12-2	95	57	13-11	85	2	14-2	111
46	10-8	143	49	11-2	96	26	12-6	97	59	13-2	84	5	14-7	116
63	10-9	95	52	11-5	98	29	12-1	94	69	13-6	75	7	14-1	110
			59	11-0	100	30	12-1	113	*Sixth Grade*			11	14-11	109
			64	11-9	91	35	12-5	104	1	13-4	98	12	14-0	112
			Fifth Grade			36	12-10	90	6	13-5	102	17	14-0	141
			1	11-10	105	38	12-4	91	9	13-10	94	23	14-5	99
			7	11-3	152	39	12-6	108	13	13-3	101	24	14-3	119
			8	11-7	105	45	12-2	105	14	13-11	94	27	14-0	92
			16	11-10	98	53	12-9	93	15	13-10	88	30	14-0	115
			24	11-9	103	55	12-7	82	16	13-8	107	33	14-0	127
			32	11-4	113	74	12-2	83	17	13-11	98	35	14-1	106
			33	11-6	100	79	12-7	89	22	13-10	120	38	14-9	88
			40	11-5	106				23	13-3	107	39	14-5	109
			41	11-7	126	*Sixth Grade*			32	13-9	98	42	14-5	117
			44	11-2	116	10	12-4	140	38	13-7	108	43	14-5	93
			47	11-5	111	18	12-10	91	39	13-3	91	46	14-2	97
			54	11-6	136	21	12-0	102	42	13-9	122	47	14-5	80
			56	11-8	109	25	12-8	135	45	13-9	119	53	14-5	99
			61	11-9	88	30	12-10	105	47	13-5	93	54	14-10	83
			62	11-4	93	35	12-11	123	49	13-3	89	55	14-8	84
			64	11-8	98	36	12-3	134	52	13-1	105	57	14-0	93
			65	11-2	91	43	12-10	104	54	13-7	119	61	14-0	112
			67	11-6	95	46	12-11	111	57	13-11	126	63	14-10	88
			68	11-10	93	51	12-7	121	61	13-2	91	64	14-2	92
			70	11-11	94	55	12-7	117	67	13-1	92	*Eighth Grade*		
			71	11-2	162	58	12-3	119	*Seventh Grade*			54	14-8	102
			75	11-9	100	59	12-11	96	3	13-9	121	59	14-2	104
			78	11-9	95	66	12-1	100	13	13-3	123	65	14-6	106
			Sixth Grade			72	12-9	102	22	13-11	110			
			24	11-8	143	*Seventh Grade*			31	13-11	100	13 yrs. (contd.)		
			56	11-9	97	25	12-11	118	40	13-3	95	62	13-6	93
			Seventh Grade			48	12-6	148	45	13-3	130	65	13-4	128
			67	11-11	122	50	12-11	114	49	13-11	91	66	13-8	110
						56	12-10	122	52	13-8	114	*Eighth Grade*		
									58	13-11	113	66	13-11	97
									60	13-6	121			

the two groups of pupils in the perceptual tests. The same process carried through for the symbol tests provided an index of the relative success of low and high I. Q. in those tests. Then the two indices were compared. Theoretically, if the achievement of low and high I. Q. is nearer together in the perceptual tests than in the symbol tests (as would naturally be the case if the theory of the levels is true), then the index as obtained above for the perceptual tests would be expected to be smaller than that obtained for the symbol tests. A sample of how such an index is obtained is given in Table VII, and a combined table of a number of such indices is shown in Table VIII.

TABLE VII

Contrast of Achievement of Low and High I. Q. in Perceptual and Symbol Tests.

Chronological Ages 10 and 11									
Perceptual Tests						Symbol Tests			
	Low I. Q.					Low I. Q.			
Case	I.Q.	Score	Scores Ranked	Median	Index	Score	Scores Ranked	Median	Index
4-2	88	79	79			97	74		
4-11	88	120	85			87	74		
4-17	89	109	95			123	76		
4-32	91	95	98			99	87		
				100.5				92	
4-61	90	103	103			76	97		
4-64	91	98	109			74	99		
5-61	88	112	112			101	101		
5-65	91	85	120			74	123		
					.930				.636
	High I. Q.					High I. Q.			
4-1	108	96	95			84	73		
4-5	126	100	96			129	84		
4-9	126	111	100			128	93		
4-23	138	106	100			146	110		
4-30	114	117	100			93	119		
4-33	121	111	100			110	121		
4-38	112	107	101			135	128		
4-40	119	113	104			132	129		
4-47	112	100	106			119	132		
4-51	112	100	106			73	135		
4-57	116	111	107			147	143		
				108				144.5	
5-7	152	111	109			174	146		
5-22	151	119	111			194	147		
5-32	113	101	111			169	150		
5-41	126	106	111			150	156		
5-44	116	104	111			121	162		
5-46	143	114	113			156	167		
5-47	111	109	114			143	169		
5-54	136	95	117			162	174		
5-71	162	100	119			167	182		
6-24	143	141	138			197	194		
7-67	122	138	141			182	197		

TABLE VIII
Contrast of Achievement of Low and High I. Q. in Perceptual and Smybol Tests

	Perceptual Tests		Symbol Tests	
	Median	Index	Median	Index
	Chronological Ages 10 and 11			
Low I. Q.	100.5	.930	92.0	.636
High I. Q.	108.0		144.5	
	Chronological Ages 11 and 12			
Low I. Q.	98.0	.875	99.0	.60
High I. Q.	112.0		165.0	
	Chronological Ages 12 and 13			
Low I. Q.	103.5	.821	104.5	.60
High I. Q.	126.0		174.0	
	Chronological Ages 13 and 14			
Low I. Q.	111.0	.834	121.0	.679
High I. Q.	133.0		178.0	

It is clear from the above table that in this study the ratio (index) of achievement of low and high I. Q. is nearer to unity in every case for the perceptual tests than for the symbol tests. This is what would be expected if low and high I. Q. are nearer together in achievement on the perceptual than on the symbol level.

This study therefore consists in:

(1) Quantitative determination of the intelligence of a given group.

(2) Verifying the result by means of teachers' judgments.

(3) Testing the same group by means of (a) a number of tests which are primarily perceptual, and (b) a number of tests which are primarily symbolic.

(4) Comparison of perceptual-test results, and symbol-test results, on the basis of the criterion.

This comparison is made (a) through correlation and (b) through the computation of an index denoting per cent of capacity.

By this process it is found (1) that symbol tests surpass perceptual tests in power of discrimination of degrees of intelligence, and (2) that achievement of high and low intelligence is much closer together in perceptual than in symbol material.

The conclusion is made that the study offers evidence in favor of the theory of intelligence levels based upon an analysis of qualitative differences in *judgment* regarded as a mental "common factor."

2. In lower school grades.

This study is of the same form as the other one except that the validity of the Binet mental ages and intelligence quotients is assumed without the checking by teachers' estimates of intelligence. This assumption was felt to be justified because the whole procedure of determining the Binet results was the same as that used in the first study, and it seems safe to believe that the same validity is present.

The value of a second study lies in the confirmatory evidence which it furnishes. It would be expected that the same results as to correlations and indices of relationship between the achievement of low and high I. Q. could be looked for, but with the additional feature that the contrasts based upon differences in achievement in perceptual and in symbol tests would be expected to be less pronounced as a whole in the lower than in upper grades. This is so because if the theory of the levels is true, children of all grades of endowment will differ less in early years before the power of abstraction in any of them has had the chance for development, and consequent differentiation, which comes in later years. The following data will show how this theory works out. Table I gives Binet data (to be used as before as criterion) on 135 lower grade cases.

TABLE I

	Original Data:	Abbreviated Binet in Lower Grades.		
Case	Born	Tested	M.A.	I.Q.
		Second Grade		
1	7/22/12	1/19/20	7- 6	100
2	11/19/12	1/19/20	7- 9	108
3	5/19/03	1/14/20	6- 6	98
4	12/ 9/11	1/16/20	7- 0	87
5	6/ 6/11	1/14/20	9- 1	106
6	10/24/12	1/14/20	7- 3	100
7	7/17/12	1/16/20	7- 9	103
8	12/23/11	1/13/20	8- 3	102
9	4/20/12	1/13/20	7- 9	100
10	6/20/12	1/12/20	7- 6	99
11	2/22/12	1/12/20	6- 9	85
12	1/12/11	1/16/20	6- 3	69

TABLE I (Continued)

Case	Born	Tested	M.A.	I.Q.
		Second Grade (Continued)		
13	3/30/13	2/ 2/20	7- 9	113
14	5/ 3/12	1/16/20	7- 9	100
15	1/21/12	1/14/20	6- 9	85
16	12/ 6/12	1/14/20	7- 3	102
17	1/ 8/12	1/14/20	7- 9	96
18	7/26/12	1/16/20	7- 6	100
19	8/23/12	1/16/20	8- 9	117
20	8/11/11	1/21/20	9- 6	112
21	8/24/12	1/19/20	8- 3	111
22	1/31/10	1/21/20	8- 9	88
23	10/27/11	1/21/20	8- 0	98
24	2/28/12	1/22/20	8- 6	107
25	1/11/13	1/22/20	9- 0	128
26	8/ 1/11	1/22/20	9- 0	106
27	12/10/12	1/ 4/20	8- 6	120
28	5/26/12	1/20/20	8- 3	107
29	6/24/12	1/23/20	6- 3	82
30	7/14/12	1/22/20	8- 6	113
31	1/29/13	1/23/20	9- 0	127
32	4/ 6/11	1/30/20	8- 0	91
33	7/15/11	1/23/20	8- 3	97
34	10/13/11	1/23/20	7- 3	87
35	2/20/12	1/22/20	7- 9	98
36	5/10/11	1/22/20	9- 1	105
37	6/ 7/11	1/22/20	9- 1	105
38	5/ 9/11	1/22/20	9- 0	105
39	5/ 1/11	1/22/20	8- 9	100
40	8/ 8/10	1/22/20	7- 3	77
41	6/ 8/10	1/22/20	8- 1	83
42	3/24/12	1/22/20	8-10	112
43	4/ 2/11	1/22/20	9- 0	102
44	3/ 2/12	1/22/20	9- 4	117
45	5/ 9/12	2/ 2/20	9- 0	116
46	2/21/12	1/22/20	8- 0	101
47	1/30/12	2/ 2/20	8- 3	103
48	10/ 3/11	1/16/20	8-10	107
49	9/23/11	1/ 4/20	8- 0	96
50	7/12/12	1/22/20	8- 3	109
51	9/27/11	1/22/20	8- 3	99
52	2/18/12	1/22/20	7- 3	92
53	5/29/12	1/30/20	8- 0	105
		Third Grade		
54	12/28/10	1/19/20	8- 6	94
55	8/ 1/11	1/14/20	11- 4.5	135
56	6/ 7/11	1/16/20	9- 9	113
57	3/26/11	1/15/20	9- 0	102
58	8/28/11	1/20/20	10- 4	122
59	12/13/11	1/16/20	9- 0	111
60	5/10/12	1/20/20	8- 3	107
61	3/28/11	1/14/20	11- 4	128
62	10/16/10	1/16/20	10- 5	112
63	10/29/11	1/14/20	7- 3	87
64	11/ 1/11	1/20/20	8- 3	101
65	9/10/10	1/20/20	11- 3	120

TABLE I (Continued)

Case	Born	Tested	M.A.	I.Q.
		Third Grade (Continued)		
66	4/28/11	1/20/20	7- 9	88
67	12/19/11	1/20/20	9- 7	119
68	4/ 6/11	1/16/20	8- 9	100
69	1/27/10	1/16/20	9- 4	93
70	8/30/11	1/19/20	9- 0	107
71	11/ 1/11	1/20/20	8- 9	106
72	2/25/11	1/19/20	8- 9	99
73	2/25/11	1/20/20	12- 9.5	143
74	5/23/12	1/19/20	11- 0.5	144
75	7/23/12	1/19/20	9- 6	126
76	4/ 1/10	1/16/20	10- 1	102
77	2/16/12	1/20/20	9- 0	113
78	12/12/11	1/14/20	6- 9	83
79	2/ 3/11	1/16/20	9- 1	102
80	7/ 3/10	1/16/20	10- 2	107
81	2/ 4/11	1/19/20	10- 4	116
82	7/21/11	1/16/20	9- 3	109
83	9/26/10	1/13/20	8- 6	91
84	3/24/10	1/19/20	8- 3	84
85	7/16/12	1/19/20	10- 9	143
86	11/10/10	1/15/20	9- 4	102
87	9/19/10	1/16/20	9- 6	102
88	8/30/10	1/20/20	10- 0	106
89	7/29/11	1/15/20	8- 9	103
90	7/25/10	1/12/20	10- 9	113
91	12/ 8/08	1/14/20	12- 5.5	112
92	7/16/10	1/15/20	10- 1	106
93	7/ 1/10	1/13/20	9-11	104
94	10/ 2/10	1/15/20	9- 3	100
95	11/24/08	1/13/20	9-11	88
96	4/13/10	1/15/20	11-10.5	122
97	10/30/09	1/15/20	9- 7	93
98	12/ 4/08	1/13/20	10-11	98
99	3/16/10	1/13/20	9- 5	95
100	1/30/10	1/14/20	10- 5	105
101	2/22/09	1/12/20	10- 9	99
102	9/19/10	1/12/20	9- 0	96
103	4/14/10	1/15/20	8- 6	87
104	3/20/11	1/14/20	11- 4.5	129
105	6/28/09	1/13/20	9- 6	90
106	11/27/09	1/13/20	8- 6	83
107	2/ 4/11	1/13/20	11- 6	129
108	5/19/10	1/13/20	10- 9	111
109	12/28/09	1/13/20	10- 6	105
110	3/10/09	1/14/20	10- 8	98
111	11/12/10	1/14/20	10- 9	117
112	11/20/10	1/13/20	9- 7	103
113	6/12/10	1/15/20	10- 4	107
114	7/29/10	1/14/20	10- 2	106
115	8/17/10	1/14/20	9- 8	103
116	3/ 2/11	1/13/20	10- 8	120
117	5/ 5/10	1/14/20	10- 1	104
118	11/19/09	1/19/20	9- 7	94

TABLE I (Continued)
Fourth Grade

Case	Born	Tested	M. A.	I. Q.
119	8/14/10	1/28/20	10- 9.5	115
120	1/ 2/10	2/ 2/20	11- 0	109
121	9/12/08	11/20/19	10- 8	95
122	5/28/08	11/19/19	10- 2	89
123	5/27/08	11/21/19	9- 4	81
124	7/ 6/08	2/ 2/20	10- 5	90
125	11/10/10	1/27/20	14- 5	155
126	12/28/08	2/ 2/20	10- 1	91
127	4/ 1/09	1/28/20	10- 8	98
128	11/22/09	1/27/20	14- 3.5	140
129	11/10/08	1/27/20	9-11	88
130	8/11/07	11/19/19	9- 0	73
131	6/ 6/11	1/28/20	10- 8	123
132	12/15/08	1/26/20	9- 3	83
133	7/26/09	2/ 3/20	11-20	113
134	10/18/09	1/26/20	9-11	97
135	4/15/10	2/ 2/20	10- 5	106

After the Binet data appearing in Table I had been obtained, there was given, as before, a group test consisting of single tests, part of which were primarily perceptual and part symbol. The perceptual tests were (1) symbol digit, (2) picture completion, (3) maze, (4) pictorial sequence, and (5) pictorial identities. These were simply different standardized forms of the same type of tests used in the first study, except for the familiar maze test which does not need description. The symbol tests were (1) practical judgment, (2) opposites, (3) vocabulary.

Of the 135 cases for which Binet data are given, 134 took the tests just listed, except that because of an epidemic it was possible to give the vocabulary test to but 111 cases. Raw data for these cases appear in Table II.

TABLE II
Raw Data for Five Perceptual and Three Symbol Tests.
Second Grade

	Perceptual Tests						Symbol Tests			
Case	1	2	3	4	5	Total	6	7	8	Total
1	6	11	0	1	1	19	4	4		
2	5	10	4	6	6	31	6	0	6	12
3	5	7	3	4	1	20	6	6	3	15
4	7	9	6	3	9	34	5	8	10	23
5	8	10	8	7	7	40	7	6	3	16
6	3	8	5	4	2	22	0	0		
7	0	11	7	4	2	24	4	5	10	19
8	7	11	6	6	5	35	2	0		
9	4	8	1	0	1	14	6	3	8	17
10	6	8	1	0	2	17	0	0	0	0
11	2	3	0	1	1	7	0	0	0	0

TABLE II (Continued)

Second Grade

	Perceptual Tests						Symbol Tests			
Case	1	2	3	4	5	Total	6	7	8	Total
12	5	8	2	1	2	18	0	6	2	8
13	5	9	5	2	1	22	4	5	7	16
14	6	2	3	4	1	16	0	4	6	10
15	6	6	0	6	4	22	0	0		
16	7	11	0	5	1	24	5	6		
17	6	4	7	6	2	25	3	6	8	17
18	7	7	0	6	1	21	0	0	5	5
19	8	10	8	5	9	40	5	5	9	19
20	7	10	5	7	3	32	10	5	8	23
21	7	9	5	6	7	34	8	7	8	23
22	7	6	4	4	1	22	6	4	0	10
23	8	8	5	2	1	24	5	6	12	23
24	6	11	7	4	6	34	10	4	9	23
25	6	9	6	6	7	34	8	9	9	26
26	6	9	8	4	6	33	5	5	2	12
27	4	9	5	5	3	26	9	3	3	15
28	7	9	5	6	3	30	7	5		
29	7	6	7	4	4	28	4	5	8	17
30	6	9	2	6	7	30	2	7	13	22
31	9	6	3	6	6	30	5	3	12	20
32	3	12	6	7	2	30	5	3	4	12
33	6	7	0	7	5	25	7	5	17	29
34	8	2	0	4	1	15	5	6	5	16
35	3	9	4	1	2	19	3	2	4	9
36	8	8	7	4	9	36	0	6	13	19
37	7	11	7	7	6	38	8	6	3	17
38	7	10	6	7	2	32	7	6	14	27
39	7	10	6	7	0	30	0	5	13	18
40	7	6	4	3	2	22	3	4	8	15
41	8	9	8	7	7	39	4	3	6	13
42	4	11	7	5	9	36	4	4	4	12
43	6	8	6	6	4	30	7	4	13	24
44	0	10	5	6	5	26	3	4	20	27
45	8	12	5	5	2	32	9	8	17	34
46	6	6	0	2	2	16	2	4	12	18
47	9	9	5	5	3	31	9	3		
48	8	9	2	7	8	34	7	6	8	21
49	7	10	7	7	0	31	5	6	14	25
50	7	10	2	5	3	27	0	0	1	1
51	7	11	6	6	4	34	0	2	12	14
52	7	6	1	5	5	24	5	6	6	17
53	9	10	3	7	8	37	9	7	12	28
				Third Grade						
54	6	10	6	5	9	36	9	7	11	27
55	7	12	9	5	9	41	8	6	12	26
56	8	12	3	6	8	37	10	9		
57	6	7	4	3	5	25	8	6	13	27
58	10	10	7	6	5	38	7	6	13	26
59	0	9	4	4	0	17	8	5	9	22
60	6	8	7	5	8	34	8	7		
61	6	11	4	6	5	32	9	8		
62	7	12	8	4	4	35	9	7	20	36
63	8	11	8	5	4	36	6	4	20	30

TABLE II (Continued)
Third Grade (Continued)

	Perceptual Tests						Symbol Tests			
Case	1	2	3	4	5	Total	6	7	8	Total
64	9	10	8	5	7	39	5	7	14	26
65	8	9	4	4	9	34	10	9	13	32
66	9	7	3	5	7	31	8	8	12	28
67	8	11	4	7	6	36	9	4	15	28
68	8	12	7	7	4	38	10	6	10	26
69	6	12	6	7	9	40	7	3	17	27
70	6	8	5	5	7	31	9	6		
71	9	11	6	7	7	40	8	6		
72	7	12	7	7	8	41	10	3	16	29
73	8	10	6	7	7	38	10	10	26	46
74	8	12	7	6	9	42	10	9	17	36
75	5	10	3	2	9	29	9	6	9	24
76	7	11	5	7	4	34	8	9		
77	7	10	7	7	5	36	6	9	17	32
78	0	10	7	5	7	29	6	5	13	24
79	6	12	5	6	8	37	6	9		
80	8	11	9	7	7	42	9	7	20	36
81	9	11	7	7	9	43	10	7	9	26
82	8	11	8	5	6	38	9	6	25	40
83	3	9	4	5	6	27	8	5	13	26
84	9	12	9	6	1	37	9	4	13	26
85	8	8	6	5	9	36	10	8	22	40
86	8	12	4	7	7	38	9	7	9	25
87	8	10	9	5	8	40	7	6	17	30
88	5	8	6	0	0	19	8	6	22	36
89	10	10	9	7	6	42	9	8	19	36
90	11	11	7	6	8	43	9	9	13	31
91	9	11	10	7	9	46	10	9	10	29
92	8	11	7	7	9	42	8	7	20	35
93	6	11	4	6	7	34	8	6	18	32
94	10	12	8	7	7	44	9	6	15	30
95	8	9	6	7	7	37	8	4	20	32
96	11	11	7	7	8	44	10	8	20	38
97	6	7	6	7	8	34	10	7	19	36
98	10	11	6	7	4	38	7	7	23	37
99	7	12	8	7	7	41	10	4	7	21
100	8	10	9	7	5	39	10	7		
101	8	11	6	7	6	38	9	9	13	31
102	9	12	6	7	7	41	10	7	15	32
103	8	11	8	7	5	39	9	5	20	34
104	10	10	8	7	8	43	10	8	19	37
105	8	12	6	7	8	41	8	7	21	36
106	9	10	6	6	1	32	5	7		
107	7	10	7	7	8	39	9	7		
108	7	9	6	7	5	34	10	7	26	43
109	7	11	8	7	8	41	8	5		
110	7	7	7	5	6	32	6	5	20	31
111	8	11	4	5	1	29	8	7		
112	9	11	9	6	9	44	9	8	17	34
113	5	11	6	7	8	37	9	7		
114	8	10	6	7	7	38	9	8	17	34
115	9	11	7	7	7	41	8	8	21	37
116	7	10	1	7	8	33	8	8	17	33
117	8	10	6	6	7	37	9	5		
118	8	10	3	7	7	35	9	7		

TABLE II (Continued)

Fourth Grade

	Perceptual Tests						Symbol Tests			
Case	1	2	3	4	5	Total	6	7	8	Total
121	8	10	7	7	4	36	7	9	11	27
122	7	11	5	7	9	39	8	6	18	32
123	7	9	0	6	7	29	8	4	16	28
124	10	12	9	6	8	45	9	8	14	31
125	7	12	9	7	8	43	10	9	22	41
126	9	11	9	7	4	40	9	6	20	35
127	7	11	8	7	8	41	8	10	19	37
128	7	10	3	7	1	28	10	7	23	40
129	9	10	9	6	7	41	9	9	14	32
131	9	11	9	7	9	45	6	7	17	30
132	10	9	3	6	1	29	8	8	14	30
133	12	11	6	7	9	45	10	9	19	38
134	9	12	6	7	6	40	10	7	21	38
135	9	10	5	6	4	34	8	2	19	29

On the theory expressed at the beginning of this second study that the contrast between high and low I. Q. would be less in lower than in upper grades, one would expect to find coefficients of correlation for perceptual tests and for symbol tests not quite so far apart as they were in the upper grade study, although he would still expect to find that the symbol tests correlated higher with mental age than the perceptual tests did. Examination of data in Table III (below) will show to what degree this expectation is realized.

TABLE III

Correlation of the Individual and the Combined Group Tests with Mental Age (Binet).

I. Perceptual Tests		II. Symbol Tests	
I. Symbol Digit	.39	I. Practical Judgment	.62
II. Picture Completion	.46	II. Opposites	.56
III. Maze	.39	III. Vocabulary	.72
IV. Pictorial Sequence	.47		
V. Pictorial Identities	.39		
Total Perceptual	.58	Total Symbol	.72

Comparison of this table with Table V of the first study shows that the predicted tendency for the correlation coefficients to run lower in lower grades is present especially in the battery of perceptual tests as compared with the battery of symbol tests. Neither battery shows so high a correlation as was shown by the corresponding battery in the first study. The relative relationship is, however, the same. The perceptual tests are always lower.

The vocabulary test in this table shows again the highest correlation found for any single test, but not quite so high as in the former study. All of this is significant, but it still needs to be reinforced by the computation of the index showing per cent of capacity in the two types of tests.

As before, in making these contrasts, the cases were first distributed by chronological age and I. Q.

TABLE IV

Chronological Age and Binet I. Q.

Case	7 yrs.	I.Q.	Case	8 yrs.	I.Q.	Case	9 yrs.	I.Q.
1	7-6	100	4	8-1	87	12	9-0	69
2	7-2	108	5	8-7	106	22	9-11	88
6	7-3	100	8	8-1	102	40	9-5	77
7	7-6	103	15	8-0	85	41	9-7	83
9	7-9	100	17	8-0	96	54	9-1	94
10	7-7	99	20	8-5	112	62	9-3	112
11	7-11	85	23	8-2	98	65	9-4	120
14	7-8	100	26	8-6	106	76	9-10	102
16	7-1	102	32	8-9	91	80	9-6	107
18	7-6	100	33	8-6	97	83	9-4	91
19	7-5	117	34	8-4	87	84	9-10	84
21	7-5	111	36	8-8	105	86	9-2	102
24	7-11	107	37	8-8	105	87	9-4	102
25	7-0	128	38	8-8	105	88	9-5	106
27	7-1	120	39	8-9	100	90	9-6	113
28	7-8	107	43	8-10	102	92	9-6	106
29	7-7	82	47	8-0	103	93	9-6	104
30	7-6	113	48	8-3	107	94	9-3	100
31	7-0	127	49	8-4	96	96	9-9	122
35	7-11	98	51	8-4	99	99	9-10	95
42	7-10	112	55	8-5	135	100	9-11	105
44	7-11	117	56	8-7	113	102	9-4	96
45	7-9	116	57	8-10	102	103	9-9	87
46	7-11	101	58	8-5	122	108	9-8	111
50	7-6	109	59	8-1	111	111	9-2	117
52	7-11	92	61	8-10	128	112	9-2	105
53	7-7	105	63	8-3	87	113	9-7	107
60	7-8	107	64	8-2	101	114	9-6	106
74	7-8	144	66	8-9	88	115	9-5	103
75	7-6	126	67	8-1	119	117	9-8	104
77	7-11	113	68	8-9	100	119	9-5	115
85	7-6	143	70	8-5	107	125	9-3	155
			71	8-3	106	135	9-10	106
			72	8-10	99			
			73	8-11	143			
			78	8-1	83			
			79	8-11	102			
			81	8-11	116			
			82	8-6	109			
			89	8-6	103			
			104	8-10	129			
			107	8-11	129			
			116	8-10	120			
			131	8-8	123			

The contrasts which follow are based upon an analysis of score (for the data see Table II) and chronological age and I. Q. (for data see Table IV). The method is the same as that used in the first study.

TABLE V

Contrast of Achievement of Low and High I. Q. in Perceptual and Symbol Tests.

	Perceptual Tests Median	Index	Symbol Tests Median	Index
	Chronological Ages 7 and 8			
Low I. Q.	29.5		20.0	
		.843		.769
High I. Q.	35.0		26.0	
	Chronological Ages 8 and 9			
Low I. Q.	30.0		23.0	
		.789		.718
High I. Q.	38.0		32.0	

Indices for other contrasts are as follows: (Index for total perceptual tests differs from that just given above because different number of cases were used).

TABLE VI

Perceptual Tests	Index	Symbol Tests 6 and 7	Index
Yrs. 7, 8	.805		.666
Yrs. 8, 9	.786		.656

Perceptual Tests	Index	Symbol Tests 8 alone	Index
Yrs. 7, 8	.843		.720
Yrs. 8, 9	.789		.588

In all of these contrasts the index for symbol tests is smaller than that for perceptual tests. This showing is therefore in all cases favorable to the original proposition that the achievement of low and high intelligence would be found closer together on the perceptual than on the symbol level. It should be noted, however, that the contrasts in these lower grades tend to be narrower than the ones previously shown for upper grades. This is in line with the theory previously expressed that mere age itself (as well as difference in high and low I. Q.) makes a difference in achievement in perceptual tests contrasted with symbol tests.

The study therefore consists in the same steps as those out-

lined for the first study, and the conclusion from it is the same, with additional evidence of the relationship of high and low school grade achievement. Thus it seems that the quantitative data presented in the two studies strengthen the conclusion previously arrived at through the theoretical survey of the field, and through the examination of evidences in the work of other investigators. It is fully appreciated that the number of cases used has been relatively small, and that the evidence furnished cannot be conceived to be finally conclusive. It is believed, however, that the evidence is now strong enough to warrant a definite conviction that further experimentation will confirm the tendencies shown in these studies. The relation of these conclusions to theories of intelligence and of intelligence measurement will be taken up in the next chapter.

CHAPTER VI

Modern Methods of Mental Measurement

I. The evolution of modern methods.

1. A summation of modern tendencies

The intention here is not that of giving an exhaustive account of every attempt which has been made to measure intelligence; but rather that of identifying significant modern movements, and of pointing out definite tendencies, which have led to a present prevailing attitude toward the problem.

Previous to the early years of the twentieth century, diagnosis of mental subnormality was made mostly either by physicians from the medical standpoint, or by teachers from the pedagogical standpoint. There was very little of the psychological, except as it was implied in the others. Moreover, neither the medical nor the pedagogical diagnosis had much of the exact quantitative about it; but both were made mostly in the form of estimate, personal opinion, or approximation, very much akin to such estimates of distance as those expressed in terms of "a stone's throw," "a day's travel," etc. There were no standardized units and therefore no reliable, comparable results. It is true that degrees of feeblemindedness were discriminated in such words as idiot, imbecile, or the French "débile"; but the patient called imbecile by one physician might be called idiot or débile by another. There was no common ground upon which the diagnosis was made. The degrees of feeblemindedness were named in words of psychological import, but were sometimes defined in physiological or anatomical terms (brain lesion, control of bodily functions, motility, locomotion, prehension, appetite, respiration, secretion, circulation, or bodily stigmata) and sometimes in terms of specific mental functions (sensation, perception, will attention, etc.).

All of these attempts to define feeblemindedness, and its de-

grees, resulted in little attention to the need for defining intelligence, or for getting at its fundamental nature. It was apparently taken for granted that since intelligence is the opposite of feeblemindedness it was therefore well enough understood what intelligence is. Yet, both for feeblemindedness and intelligence, no terms at all would have been safer than the ones in use, because the very vagueness of the customary terminology gave a misleading impression of definitness. Such vagueness even made it possible to confuse feeblemindedness (retarded mentality) with insanity (unbalanced mentality), a thing which could not happen at the present time except among those entirely uninitiated in the field.

It is true that in the latter part of the nineteenth century a movement appeared which had in it more of the psychological and more of the exact quantitative. It is now known, however, that this psychological movement was fundamentally on the wrong track in so far as intelligence was concerned, although it had in it something which has survived. The movement in question showed two aspects: (1) the determination of intelligence through the exact laboratory measurement of individual mental and physical traits found to be correlated with the estimates, opinions, and approximations previously mentioned; and (2) the determination of intelligence through the summation of the results of exact quantitative measurement of mental traits regarded as elements. Thus intelligence was tacitly held to be equal to the sum of one's quantitatively measured sensation, perception, memory, etc.

The first of these tendencies (the correlation of intelligence with mental and physical traits) holds its place today as a valuable supplement to the scientific measurement of intelligence itself. The second has been discarded along with the "faculty" psychology out of which it sprang, except that the mental element or trait, regarded as a unit-mental activity, still holds a very important place when viewed from a different angle.

However, the real revolution in the definition and measurement of intelligence came when, through the genius of Binet, all criteria of intelligence (the medical criterion, the social criterion,

the pedagogical criterion) were made subordinate to a perfected quantitative psychological criterion based upon the theory of *general* intelligence. The essence of this idea of general intelligence has already been given in the quotations of a previous chapter which deals with *judgment* as the common factor in intelligence and with the relation of the separate mental functions to intelligence. The customary exaggerated reliance upon the determination of amount of intelligence through its correlation with mental and physical traits was reduced to its rightful minor place, and the attempt to determine the amount of intelligence through the summation of mental traits was shown to be faulty. Then a relatively exact quantitative scale for the measurement of general intelligence was made. This scale is too well known to need description here. It was based upon judgment as a common factor in all intelligent acts, and although Binet did not hold absolutely to the use of problems involving judgment, the following quotation shows that, at bottom, that was his intention.

* "As a result of all this investigation, in the scale which we present we accord the first place to judgment; that which is of importance to us is not certain errors which the subject commits, but absurd errors, which prove that he lacks judgment. We have even made special provision to encourage people to make absurd replies. In spite of the accuracy of this directing idea, it will be easily understood that it has been impossible to permit of its regulating exclusively our examinations. For example, one cannot make tests of judgment on children of less than two years when one begins to watch their first gleams of intelligence. Much is gained when one can discern in them traces of coördination, the first delineation of attention and memory. We shall therefore bring out in our lists some tests of memory; but so far as we are able, we shall give these tests such a turn as to invite the subject to make absurd replies, and thus under cover of a test of memory, we shall have an appreciation of their judgment."

Binet's two proposals: (1) to make exact quantitative measurement of general intelligence; and (2) his later adopted plan of grouping together at one age all of the tests normal for that age,

* The Development of Intelligence, Vineland Laboratory, page 43.

have proved to be the dominant features of modern intelligence measurement. The only notable competitor is what is known as the "Point Scale System" which adopts the idea of general intelligence, but rejects the chronological-mental age classification, and measures intelligence in "points won". But this proposal has been shown by Otis and by others to be not fundamentally different from the Binet method.

Binet's work was first introduced to this country by Goddard, who made an American revision of it. Kuhlmann and others have also offered revisions; but the last and easily the most universally successful and important is Terman's Stanford Revision.

Important variations of the Binet plan appear in the "performance scales" and in group intelligence testing. The former have been referred to in previous chapters, especially as to their relation to levels in intentionally controlled intelligence. It needs to be emphasized here that these scales, built either upon the Binet plan or upon the essentially similar "point scale" plan, have great potential value for the measurement of non-English speaking foreigners, of the illiterate, the deaf, etc., but as general scales of intelligence they fail because they feature, in the main, the perceptual level only. Since it has been shown to be probable that both high and low intelligence can work at this level, it might be possible to get differentiation by the use of very many graded and especially carefully standardized tests; but this would not be an economical method in comparison with scales which use more abstract material. Neither would it be logical to attempt entirely to overcome the difficulty by complicating perceptual tests with abstract factors, although under certain conditions this approach is well worth while. Therefore the performance scale is inadequate as a total plan for grading intelligence, but it remains an essential subsidiary element for use under certain special conditions.

Examples of the most commonly known of the performance tests are those of Pintner and Patterson, Healy, Knox, Stenquist, and Kent. The Porteus maze tests are of this nature also; but are complicated more than some of the others by abstract requirements. They therefore are proportionately valuable, al-

though the narrow range of judgment tested by them makes it desirable that they should be used as an element in a scale with other tests rather than by themselves.

As to modern group testing, it may be said that it was first introduced by Otis, that it adapts for group work certain tests similar to the individual Binet tests, and that it involves no new principles antagonistic to the Binet, although Otis suggests supplementary mathematical bases which provide for what he terms "an absolute point scale" in distinction from the point scale of the Yerkes-Bridges type. There can be no doubt that the more rapid work which the group method permits makes it of supreme importance, since it can be used for the bulk of the work with large numbers and the special cases can then be handled through individual tests.

Some of the best known of the group tests are those of Otis, and the army tests based primarily upon the Otis tests. The latter show the same tendency to divide into perceptual and symbol tests as has already been noted in the individual tests, and the fundamental reason for the division is the same. Illiterates and foreigners in the army could not be handled on the basis of tests requiring much use of language. Hence the development of the army group test Beta, and the utilization in the army also of many of the individual performance tests of the type of the Pintner and Patterson, Healy, Stenquist, Porteus, and others. Other group tests of the same general character as the army tests are the Pressey tests, the Haggerty tests, the Myers Mental Measure, the new National Research Council tests, Terman's Mental Ability tests for grades VII to XII, etc.

But all mental measurement of today has swung to the Binet principles, and the Binet criterion easily remains the dominating force in modern intelligence measurement. However, the results from the Binet tests, and their variations, are supplemented wherever possible by other psychological, pedagogical, and neurological data. There is also, where possible, a provision for retests, and for a period of observation of the subject before the final interpretation is made of the data. Persons with little more than a clerk's knowledge of the standard procedure can do much in the

gathering of data, but where serious issues are involved, the interpretation calls for the widest experience and training in psychology and in the related sciences involved.

2. SOME GENERAL SIDE LIGHTS ON THE DEVELOPMENT OF THE MODERN VIEW.

But the modern view has come only as the culmination of a long conflict with the former preconceptions concerning intelligence. A brief discussion of the most salient points of this conflict will still further clarify the situation. There was for a long time (and one might almost say that there still is) a tendency to cling to the earlier medical and psychiatric conceptions wherein the criteria of feeblemindedness are expressed in physical, medical, social, or vague psychological terms rather than in the more definite concept of general intelligence and mental age. Binet's work was well along in France by 1908, yet in that year "The British Royal Commission on the Feebleminded" defined that class as "persons who may be capable of earning a living under favorable circumstances, but who are incapable from mental defect existing from birth or from an early age: (a) of competing on equal terms with their normal fellows; or (b) of managing themselves and their affairs with ordinary prudence". Such a definition, though vaguely psychological as well as social, is open to any interpretation which varying conditions and the personal equation of the physician or the psychiatrist may develop. It has nothing of the stability which is possessed by a mental age established through the use of a standardized scale.

But even Tredgold's original formulation was of the same order, although it included incomplete cerebral development (psychological criterion) as well as mental defect. Even as late as 1914 he defined amentia as "a state of restricted potentiality for, or arrest of, cerebral development, in consequence of which the person affected is incapable at maturity of so adapting himself to his environment or to the requirements of the community, as to maintain existence independently of external support." Thus in this definition there is the vague psychological criterion, the medical or physiological criterion, the social criterion, and also

the more modern criterion of "adaptation"; and yet all are so indefinite as not to compare in any way with more exact scientific measurement based upon a standard psychological scale.

There has persisted also an effort to determine amount of intelligence through the correlation with bodily and mental traits and through the summation of mental traits measured quantitatively. The former is valuable if recognized and given its rightful subordinate position. Much good work has been done along this line as supplementary to diagnosis by the Binet and similar scales.

As to the attempt to get at intelligence through the quantitative summation of mental traits, it may be said that this is less and less in evidence. Some of the important places where it has tended to persist are the profile method of Rossilimo (1912), the tachistoscopic method proposed by Netschajeff (1917), and in the Yerkes-Bridges Point Scale. The authors of the latter arrange tests according to individual functions, but that part of their work has had little emphasis or apparent success and the scale has filled an important place through its resemblance to the Binet method, rather than because of the feature under discussion. Indeed such an effort can only have success when the subject is tested, not for the amount of the function, but for his ability to solve problems in terms of the function; and although this may have really been what the Yerkes-Bridges scale was meant to do, the authors do not make it clear that such was their idea.

3. CERTAIN MINOR AND MAJOR VIEWS AND STUDIES IN CONFIRMATION OF THE EXISTENCE OF A COMMON FACTOR FOR INTELLIGENCE.

Meumann, Stern, and Ebbinghaus have, in a general way, presented the idea of a common factor, particularly in the definitions which they give of intelligence. Meumann, as interpreted by Terman, presents a two-fold definition: "From the psychological point of view, intelligence is the power of independent and creative elaboration of new products out of the material given by memory and the senses. From the practical point of view, it involves the ability to avoid error, to surmount difficulties, and to

adjust to environment." Stern says that intelligence is "the general capacity of an individual consciously to adjust his thinking to new requirements; it is general adaptability to new problems and conditions of life." Ebbinghaus, as a result of the Breslau investigation in 1905, came to take a view of intelligence which emphasized the ability to combine dissociated elements into a meaningful whole. He called this "combinative ability", and developed a tentative method for testing it, through asking the subject to fill in elisions in mutilated prose. This method has been further developed in many ways since that time, and is a common feature as a single test among groups of tests in most modern systems. Sentence completion, picture completion, etc., are variations of this test.

Intelligence has also been conceived as synonymous with a common mental factor called attention, clear awareness, concentration, etc.; and with other single mental factors; but it is very easy to believe that Meumann, Stern, Ebbinghaus, and other authorities of major importance support, in effect, the view of Binet which makes judgment the essential and common factor. Where other factors are named it seems clear that their advocates have definitely, even if unconsciously, identified intelligence with judgment and simply have made a further identification of what they conceive the central element in the process.

But the most convincing evidence of the existence of the common factor is the mathematical proof found in the correlational studies of such writers as Abelson, Burt, and Hart and Spearman. As to the essential nature of this generally conceded common factor there is a certain amount of disagreement. Abelson (1911) leaned toward "clear awareness", the lack of which in any case he refers to cerebral impairment. Burt supports essentially the same view when in his earlier work (1911) he combines Binet's tendency to emphasize the power of voluntary attention, with McDougall's view of the physiological factors in attention. But Burt also emphasizes judgment, reasoning, seeing relations, as the most fundamental things in intelligence, and suggests a scale of tests featuring all processes from the highest to the lowest (regarding reasoning as the highest). Thus he demands both

complexity and range, with reasoning given the most weight. The difference between this view and that which has been urged in these pages lies in the fact that Burt appears to see levels of intelligence delimited by quantity of judgment ability, while herein the levels discriminated depend upon quality of judgment ability.

Spearman and Hart (see British Journal of Psychology, March 1912) discuss three views of the common factor: (1) non-focal, (2) multi-focal, and (3) uni-focal. In the first, abilities are regarded as absolutely specific, and therefore non-correlating, except in cases where, by chance, like elements happen to be present in the different performances. In the second, faculties, types, or levels are regarded by them as furnishing foci of likenesses, and therefore of groups of correlations, such as might be expected from Thorndike's theory of levels of sensitivity, association, and dissociation. In the third there is assumed to be a common factor in all performances, and therefore all performances may be expected to correlate to the extent to which the common factor is present.

While admitting the essential truth of the Spearman and Hart position, there are several observations which may be made. (1) The non-focal theory can, as they say, probably safely be discarded. Modern psychological investigation by Coover, Angell, Rugg, and others supports this conclusion. (2) The opinion of Spearman and Hart that the multi-focal theory is necessarily antagonistic to the uni-focal theory is not necessarily true if one admits the view that the common factor, judgment, extends through all intelligence; but that in a certain part of the field the quality of judgment is mechanical (thus differentiating mechanically controlled intelligence), and in another part of the field, purposive (thus differentiating intentionally controlled intelligence). Thorndike's sensitivity and association levels would then seem to belong to the field of mechanically controlled intelligence, while his dissociation (free idea) level, would seem to belong to intentionally controlled intelligence. Moreover in the field of intentionally controlled intelligence, the common factor, judgment, may again be conceived as determining levels according to the

quality of the mental elements (sensations, percepts, images, symbols) between which relationships are discerned. (3) The theory thus interpreted does not involve "faculty" psychology if the mental elements considered are thought of as unit-activities of a total mind. (4) The whole theory supports the Binet view. It is true that Binet called the common factor judgment, and Spearman and Hart (and others) define it in terms of cortex energy, etc., but this may be viewed as only a case of psycho-physical parallelism in the analysis of which one person speaks in terms of the mental correlate, and the other in terms of the physical correlate. When the cortical change comes, the judgment is exercised. It is not necessary to postulate that one is caused by the other, but only that one accompanies the other.

Hence, there is a very generally supported view of the existence of a common factor, which factor can, roughly at least, be measured objectively and expressed through the use of an age scale; and the Binet scale is the basis and universally used expression of the theory.

II. Possible results of the theory upon methods of mental measurement.

It should now be clear that the key to the theory proposed by the thesis is (1) such a definition of intelligence as makes non-predictable variation the paramount thing in it; (2) the acceptance of the theory of a common factor responsible for non-predictable variation, and quantitatively measurable in terms of an age scale; (3) an appeal to the literature and to original quantitative experimentation in support of a new understanding of intelligence based upon an analysis of *qualitative* differences in the common factor. Primarily the qualitative differences appealed to are referred to differences in power to handle the concrete and the abstract. The reader should hold it definitely in mind that no claim of originality is here made for the theory that intelligence is conditioned by different degrees of control over the concrete and the abstract. It has been shown that the intuitive psychology of the layman ferreted out that fact long ago. But an attempt has here been made to show the connection of this popular

conception with that of psychological levels differentiated by varying abilities to manipulate judgment in terms of the mechanical and the intentional, and in terms of different unit-mental-activities within the intentional. Assuming that a certain amount of proof has been offered in favor of the hypothesis of levels conditioned by these qualitative differences in the common factor, and that there is at least a strong probability that the theory is true, the following practical bearings of this conclusion upon methods of mental measurement are suggested.

1. EMPHASIS UPON THE VALUE OF THE LANGUAGE TEST.

One result of the study is to emphasize the value of the language test as an intelligence test. By language test is not meant the mere mechanical flow of words; but instead a genuine command of language as the tool of thought. There has been a growing tendency in intelligence measurement to try to get away from the language test. This tendency has been one reason for the development and use of performance scales even with subjects who labor under no handicap with regard to language ability. However, the desire to minimize the language factor has had its origin largely in the fact that owing to their ability to put many words together, the feebleminded have often been found to give an impression of an intelligence which they do not really possess. Ideas expressed in language have two phases: (a) the word, or symbol, and (b) the meaning of the word or symbol. The feebleminded often have the first of these without the second. When the mechanical use of language can be sufficiently guarded against, language ability becomes one of the best evidences of intelligence, of ability to work on the symbol level in contrast to the perceptual level.

2. TENDENCY TO THE DEVELOPMENT OF MORE DIAGNOSTIC SCALES OF INTELLIGENCE BASED UPON THE SEPARATE SCALING OF QUALITATIVE DIFFERENCES IN THE COMMON FACTOR.

It seem likely that as a supplement to the single scale which now features mechanically controlled intelligence, intentionally controlled intelligence, and reproductive (pedagogical) intelli-

gence, together, there will tend to appear also separate scales of these three types of intelligence constructed upon the same principles. In fact such an outcome is already in evidence. Reproductive, or pedagogical scales have become common; and De Sanctis, even as early as 1911, suggested the distinction between "lower ideation" and "higher ideation". This distinction corresponds in intent at least roughly to the mechanically controlled intellligence and intentionally controlled intelligence which have been discussed. The idea has also of late appeared in concrete operation in the work of Link and others in employment psychology. The investigators in this field have found it necessary to develop separate scales of *technique* and of *intelligence;* or, in other words, separate scales of mechanically controlled intelligence and of intentionally controlled intelligence. The very fact that practical application of tests has brought out the demand for three types of scales is in itself a degree of proof of the theory as outlined; and there is added proof in the tendency of modern students of intelligence to stress the intentional and immediate solution of problems as the central thing in intelligence. It is the central thing in the highest type of intelligence, the type differentiated by judgment of the intentionally controlled quality.

The present Binet scale, or any other perfected upon the same principles, can give a result which shows only a total mental age. One can ascertain that a subject is excellent or normal or feeble-minded by comparison with chronological age, but neither the Binet mental age nor the intelligence quotient derived from it shows specifically wherein the excellence or the defect of the subject consists. The situation is similar to that which has developed with pedagogical scales. Take for example the field of handwriting. Thorndike's scale of "general merit" in handwriting is directly comparable with the Binet scale of general ability in intelligence. The scale measures a total ability, but does not attempt to be analytic or diagnostic as to particular faults. Such a scale has many values (and always will have), as "general merit" handwriting scales have abundantly proved; but it has been necessary for diagnostic purposes to develop supplementary scales of sep-

arate elements of handwriting excellence such as the Ayres division into slants and the more extended Freeman division into a larger number of parallel scales of important elements. With an opportunity to scale a pupil's handwriting by the several scales of the elements, that pupil's special difficulty can be located and the correct assistance given.

It seems probable therefore that there should be developed a scale or a system of scales which would measure separately not only mechanical, pedagogical, and purposive intelligence, but which also (in purposive intelligence at least) would measure separately the ability to judge (a) in terms of perceptual material, and (b) in terms of imaginal material, and (c) in terms of symbol material. Such a series of scales would be much more diagnostic than the general scales now in existence, would help correctly to place subjects in life, and, by more nearly locating the defect would lead the way to a more effective study of possible remedies for mental defects. This is extremely important, for it is not impossible that the present view of the permanency of mental defect needs at least partial revision. At least they need very extended and critical testing, and the more definite analysis which would be possible through the qualitative extension of the scales would be a very important assistance in this work.

3. INCREASED TENDENCY TO SPECULATE UPON THE PROBLEM AS TO WHETHER THE DEVELOPMENT OF INTELLIGENCE CEASES SOON AFTER ADOLESCENCE.

The emphasis upon judgment as the common factor in intelligence, and upon levels of intelligence determined by qualitative differences in the mental elements concerning which judgment is rendered, may throw light upon the vexed question as to whether the development of intelligence ceases at about the chronological age of sixteen or eighteen as the Binet theory tends to hold. All experiments with Binet material and procedure have tended to sustain this view. They have not brought out reliable evidences of increment beyond the point mentioned. Hence there is the inference that mental growth reaches approximately its maximum,

as does physical growth, a few years after adolescence. Of course there may be after this time an increase in the ability to get the most out of the intelligence which one has, just as one may learn to make better and better use of his physique even after physical growth ceases; but to distinguish between increase in intelligence itself and increase in one's power to use a fixed amount of intelligence appears to some persons as, in a sense, a begging of the question. For, off hand, one tends to believe that if a college senior can solve more real problems than he could when he was a high school senior, then by that very fact he is to be judged actually more intelligent. By the same criterion he might be found more intelligent when he is chronologically forty than at the time of his graduation from college.

Yet the point in question is exactly the one just raised. Does a person show more success in problem-solving at forty than at sixteen or eighteen? Possibly the answer lies in asking whether one means *more* problem-solving or *better* (or different) problem-solving. Thus perhaps it is again a question between quantity and quality. In this thesis the view has been supported that the power to deal with abstractions must show development around about twelve years (chronologically) or else the subject is marked as mentally inferior. That is, he must begin to exhibit a certain quality of judgment at about that time or he is defective. By the time he is sixteen or eighteen the Binet tests seem to show that his power of abstraction is developed about as far as it ever will be, that significant increase in intelligence beyond this age does not seem to occur. Perhaps this appears to hold (a) because the peculiar quality of abstract judgment (organizing power) required to earn the new increment of intelligence is not tested by the Binet tests; and (b) because the peculiar quality of abstract judgment in question is so rare that it is easily missed by *any* system of tests. There is a type of abstract synthesis which requires not minutes or hours, but months, years, or a lifetime. Many of the world's supreme problems have been solved by men who have shown a peculiar, dogged persistency in pursuing an idea until its relation to other ideas and their relation to it became apparent. Speed is not an element in such a feat. The essence of the

achievement is judgment of a peculiar organizing type, which sees through insignificant details and finally seizes upon the really significant factors. It may be, therefore, that after types of intelligence are differentiated on the qualitative basis of perceptual, imaginal, and symbolic, it will be necessary to distinguish a higher qualitative differentiation within the symbolic itself, which the limitation of brief time for testing, and incomplete insight into values, have left still untapped by any exact quantitative measurement. Perhaps it is too elusive to be tapped. At any rate, one may, if he so desires, speculate upon its existence, and he is likely to do so if he is not fully satisfied with the other view that intelligence ceases to develop at the age of sixteen or eighteen years. This speculation concerning a real increase in intelligence itself, an increase based upon qualitative differences in the power of abstract thought, is possibly not antagonistic to the essential Binet principles but merely supplementary to them.

III. Summary.

In this thesis it has been held:

1. That the problem of intelligence is within the problem of adaptation.
2. That not all adaptation, but only non-predictable adaptation is intelligent.
3. That in all non-predictable adaptation there is a common factor, judgment.
4. That sometimes the quality of judgment is mechanical and sometimes intentional.
5. That if the term intelligence is used at all with reference to mechanically controlled judgment, the qualified expression *mechanically controlled intelligence* should be used.
6. That intentionally controlled judgment should be called *intentionally controlled intelligence.*
7. That intentionally controlled intelligence itself exists in levels determined in popular language by different degrees of concreteness and abstractioness involved in the exercise of the common factor.
8. That the terms concrete and abstract are only popular expressions for the more technical psychological terms which designate unit-mental-activities.

9. That there could be discriminated as many levels in intentionally controlled intelligence as there are distinct unit-mental-activities; but that it is expedient to discriminate but three levels—the perceptual level, the image level, and the symbol level.

A degree of proof of the existence of the levels has been offered (a) by reference to existing literature, and (b) by original quantitative research. The conclusion is drawn that more diagnostic testing of intelligence could be done if the exising age-scales of general intelligence were supplemented by scales which test for ability on the different levels.

The main contributions are (a) greater insight into the definition and nature of intelligence, and (b) the pointing of the way toward more diagnostic measurement of intelligence through the provision for measurement based upon the levels determined by qualitative differences in the common factor, judgment.

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